POWER TRIODE

AMPLIFIER or OSCILLATOR — Class C
With Separate, Rectified, Unfiltered, Single-Phase, Full-Wave Plate Supply
NATURAL COOLING

Maximum Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>2700 max.</th>
<th>3000 max.</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-450 max.</td>
<td>-450 max.</td>
<td>volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>500 max.</td>
<td>500 max.</td>
<td>ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>100 max.</td>
<td>100 max.</td>
<td>ma</td>
</tr>
<tr>
<td>PLATE INPUT†</td>
<td>1250 max.</td>
<td>1500 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>300 max.</td>
<td>350 max.</td>
<td>watts</td>
</tr>
</tbody>
</table>

Typical Operation with Natural Cooling:

| DC Plate Voltage       | 2500      | 2750      | volts |
| DC Grid Voltage        | -130      | -135      | volts |
| From a grid resistor of| 1560      | 1770      | ohms  |
| DC Plate Current       | 450       | 450       | ma    |
| DC Grid Current (Approx.) | 83    | 76        | ma    |
| Driving Power (Approx.)† | 27      | 25        | watts |
| Output-Circuit Efficiency (Approx.) | 85 | 85 | % |
| Useful Power Output (Approx.) | 935† | 1020† | watts |

FORCED-AIR COOLING

Maximum Ratings, Absolute Values:

| DC PLATE VOLTAGE       | 3600 max. | volts |
| DC GRID VOLTAGE        | -450 max. | volts |
| DC PLATE CURRENT       | 500 max.  | ma    |
| DC GRID CURRENT        | 100 max.  | ma    |
| PLATE INPUT†           | 1800 max. | watts |
| PLATE DISSIPATION       | 400 max.  | watts |

Typical Operation with Forced-Air Cooling:

| DC Plate Voltage       | 3300      | volts |
| DC Grid Voltage        | -155      | volts |
| From a grid resistor of| 2100      | ohms  |
| DC Plate Current       | 450       | ma    |
| DC Grid Current (Approx.) | 73     | ma    |
| Driving Power (Approx.)† | 26      | watts |
| Output-Circuit Efficiency (Approx.) | 85 | % |
| Useful Power Output (Approx.) | 1240† | watts |

- Continuous Commercial Service.
- Intermediate Commercial and Amateur Service.
† Power input to plate is 1.23 times the product of dc plate voltage times dc plate current.
†† This value of useful power is measured at load of output circuit having the indicated efficiency.
†: See next page.

Indicates a change.
## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current.</td>
<td>1</td>
<td>9.4</td>
<td>10.6</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate.</td>
<td>-</td>
<td>5.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Grid to filament.</td>
<td>-</td>
<td>10.1</td>
<td>14.5</td>
</tr>
<tr>
<td>Plate to filament.</td>
<td>-</td>
<td>6.4</td>
<td>10.6</td>
</tr>
<tr>
<td>Amplification Factor.</td>
<td>2</td>
<td>31.5</td>
<td>38.5</td>
</tr>
<tr>
<td>Grid Current.</td>
<td>3</td>
<td>160</td>
<td>380</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>3</td>
<td>490</td>
<td>810</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>4</td>
<td>60</td>
<td>140</td>
</tr>
<tr>
<td>Power Output.</td>
<td>5</td>
<td>1150</td>
<td>-</td>
</tr>
</tbody>
</table>

**Note 1:** With 10 volts dc on filament.
**Note 2:** With 10 volts ac on filament, dc grid voltage of -10 volts, and dc plate voltage adjusted to give dc plate current of 200 ma.
**Note 3:** With 10 volts ac on filament, dc plate voltage of 100 volts, and dc grid voltage of +100 volts.
**Note 4:** With 10 volts ac on filament, dc plate voltage of 2500 volts, and dc grid voltage of -50 volts.
**Note 5:** In self-excited oscillator circuit, and with 10 volts ac on filament, dc plate voltage of 4000 volts, dc plate current of 450 ma, dc grid current of 80 to 120 ma, grid resistor of 5000 ohms, and frequency of 30 Mc.

- Obtained from a grid resistor of the value shown or from a combination of grid resistor and cathode resistor. Fixed bias operation is not recommended. The bias resistor should not be bypassed for the plate and grid voltage supply frequency.
- From a driver with a rectified, unfiltered, single-phase, full wave plate supply.

### RATINGS vs FREQUENCY WITH NATURAL COOLING

<table>
<thead>
<tr>
<th>Frequency</th>
<th>30</th>
<th>50</th>
<th>75</th>
<th>Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM PERMISSIBLE PERCENTAGE of MAXIMUM RATED PLATE VOLTAGE and PLATE INPUT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B telephony</td>
<td>100</td>
<td>98</td>
<td>94</td>
<td>%</td>
</tr>
<tr>
<td>Class C telephony</td>
<td>100</td>
<td>90</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>Class C telegraphy</td>
<td>100</td>
<td>90</td>
<td>72</td>
<td>%</td>
</tr>
</tbody>
</table>

### RATINGS vs FREQUENCY WITH FORCED-AIR COOLING

<table>
<thead>
<tr>
<th>Frequency</th>
<th>20</th>
<th>50</th>
<th>75</th>
<th>Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM PERMISSIBLE PERCENTAGE of MAXIMUM RATED PLATE VOLTAGE and PLATE INPUT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B telephony</td>
<td>100</td>
<td>97</td>
<td>93</td>
<td>%</td>
</tr>
<tr>
<td>Class C telephony</td>
<td>100</td>
<td>83</td>
<td>65</td>
<td>%</td>
</tr>
<tr>
<td>Class C telegraphy</td>
<td>100</td>
<td>83</td>
<td>65</td>
<td>%</td>
</tr>
</tbody>
</table>

NOTE 2: THE MOUNTING SHOULD PROVIDE LIBERAL CLEARANCE FOR THIS TIP.

NOTE 3: THE PLANE THROUGH THE FLAT SIDE OF THE FILAMENT TERMINAL IS 90° ±7° WITH RESPECT TO THE PLANE THROUGH THE AXES OF THE FILAMENT TERMINALS.
AVERAGE PLATE CHARACTERISTICS

$E_p = 10.0 \text{ VOLTS AC}$

PLATE AMPERES

PLATE VOLTS ($E_b$)
835
R-F POWER AMPLIFIER,
A-F POWER AMPLIFIER, MODULATOR

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament</td>
<td>Thoriated Tungsten</td>
</tr>
<tr>
<td>Voltage</td>
<td>10 a-c or 4-c volts</td>
</tr>
<tr>
<td>Current</td>
<td>3.25 amp</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>12</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitance</td>
<td></td>
</tr>
<tr>
<td>Grid to Plate</td>
<td>9.25 μf</td>
</tr>
<tr>
<td>Grid to Filament</td>
<td>6 μf</td>
</tr>
<tr>
<td>Plate to Filament</td>
<td>5 μf</td>
</tr>
<tr>
<td>Maximum Overall Length</td>
<td>7-7/8&quot;</td>
</tr>
<tr>
<td>Maximum Diameter</td>
<td>2-5/16&quot;</td>
</tr>
<tr>
<td>Bulb</td>
<td>T-18</td>
</tr>
<tr>
<td>Base</td>
<td>Jumbo 4-Pin</td>
</tr>
<tr>
<td>RCA Socket (Type UT-541-A)</td>
<td>Stock No.9936</td>
</tr>
</tbody>
</table>

For additional data, see Type 211. The 211 and the 835 are identical except for interelectrode capacitances.

Data on operating frequencies for the 835 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

836
HALF-WAVE HIGH-VACUUM RECTIFIER

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater</td>
<td>Coated Unipotential Cathodes*</td>
</tr>
<tr>
<td>Voltage</td>
<td>2.5 a-c volts</td>
</tr>
<tr>
<td>Current</td>
<td>5.0 amp</td>
</tr>
<tr>
<td>Maximum Overall Length</td>
<td>6-9/16&quot;</td>
</tr>
<tr>
<td>Maximum Diameter</td>
<td>2-7/16&quot;</td>
</tr>
<tr>
<td>Bulb</td>
<td>ST-19</td>
</tr>
<tr>
<td>Cap</td>
<td>Medium</td>
</tr>
<tr>
<td>Base</td>
<td>Medium 4-Pin, Beyonet</td>
</tr>
<tr>
<td>RCA Socket (Type UR-542-A)</td>
<td>Stock No.9937</td>
</tr>
</tbody>
</table>

Maximum Ratings Are Absolute Values

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Inverse Plate Voltage</td>
<td>5000 max. volts</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1.0 max. amp.</td>
</tr>
<tr>
<td>Average Plate Current</td>
<td>0.25 max. amp.</td>
</tr>
</tbody>
</table>

* The cathodes should be allowed to come up to operating temperature before plate current is drawn from the tube. For average conditions the delay is approximately 40 seconds.

The 836 has two separate cathodes, each of which is connected to its respective heater. Plate circuit return should be made to the center-tap of the heater transformer.

Dec. 1, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.
HALF-WAVE HIGH-VACUUM RECTIFIER

AVERAGE PLATE CHARACTERISTIC

Type 836

\[ E_f = 2.5 \text{ Volts} \]

Plate Milliamperes

- 1000
- 800
- 600
- 400
- 200
- 100

Volts D.C.

Pin 1 - Heater & Cathode
Pin 2 - No Connection
Pin 3 - No Connection
Pin 4 - Heater & Cathode
Cap - Plate

--- indicates a change.

Dec. 1, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.

Any

TUBE MOUNTING POSITION

CAP .550- .576" DIA.

MEDIUM 4-PIN BAYONET BASE

92C-447RA4

BOTTOM VIEW OF SOCKET CONNECTIONS

NC 2

NC

NC

AA = PLANE OF ELECTRODES

Pin 1 - Heater & Cathode
Pin 2 - No Connection
Pin 3 - No Connection
Pin 4 - Heater & Cathode
Cap - Plate
HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:
Filamentary Cathode, Coated:
Voltage: 5 ± 5% ac volts
Current: 30 amp
Minimum heating time
at rated voltage: 60 sec
Peak Tube Voltage Drop (Approx.): 15 volts

Mechanical:
Terminal Connections:
F1 - Filament, Cathode Shield, return
F2 - Filament, Cap - Anode

Mounting Position: Vertical with filament end down

Maximum Overall Length: 29-7/8"
Seated Length: 19-1/2" ± 3/8"
Maximum Diameter: 7-1/8"
Weight (Approx.): 4 lbs
Bulb: GT-56
Cap: Skirted Large (JETEC No.C1-10)
Base: Terminal-Support Shell (JETEC No.F0-2)

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under Maximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed-Mercury to Equilibrium Above Ambient Temperature (Approx.):
No load: 11.5 °C
Full load: 15 °C

* with filament volts = 4.78 and no heat-conserving enclosure.
# Half-Wave Mercury-Vapor Rectifier

## Half-Wave Rectifier

**Maximum Ratings, Absolute Values:** For supply frequency of 60 cps

<table>
<thead>
<tr>
<th>Operating Condensed-Mercury Temperature Range</th>
<th>25° to 60°C</th>
<th>30° to 40°C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Peak Inverse Anode Voltage</strong> (Volts)</td>
<td>10000 max.</td>
<td>22000 max.</td>
</tr>
<tr>
<td><strong>Anode Current:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak (Amp)</td>
<td>40 max.</td>
<td>40 max.</td>
</tr>
<tr>
<td>Average**</td>
<td>10 max.</td>
<td>10 max.</td>
</tr>
<tr>
<td>Fault, for duration of 0.2 second max. (Amp)</td>
<td>400 max.</td>
<td>400 max.</td>
</tr>
</tbody>
</table>

## Characteristics Range Values for Equipment Design

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current (Amp)</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Critical Anode Voltage (Volts)</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Peak Tube Voltage Drop (Volts)</td>
<td>3</td>
<td>25</td>
</tr>
</tbody>
</table>

**Note 1:** With 5 volts rms on filament.

**Note 2:** With 4.75 volts rms on filament, and condensed-mercury temperature at 25°C, or above.

**Note 3:** With 5 volts rms on filament, condensed-mercury temperature of 35° ± 5°C, peak anode current of 100 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center tap of filament transformer.

## Operating Considerations

**X-Ray Warning.** X-rays are produced when the 857-B is operated with a peak inverse voltage above 16000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection to the operator.

**Shields and rf filter circuits** should be provided for the 857-B if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

**Note:** Averaged over any period of 30 seconds maximum.

---

**July 1, 1955**

**Tube Division**

**Radio Corporation of America, Harrison, New Jersey**
### HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

<table>
<thead>
<tr>
<th>CIRCUIT</th>
<th>MAX. TRANS. SEC. VOLTS (RMS)</th>
<th>APPROX. DC OUTPUT VOLTS TO FILTER</th>
<th>MAX. DC OUTPUT AMPERES</th>
<th>MAX. DC OUTPUT KW TO FILTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half-Wave</td>
<td>15400Ω</td>
<td>7000</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>Single-Phase</td>
<td>700Ω</td>
<td>3200</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>In-Phase Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-Wave</td>
<td>7700Ω</td>
<td>7000</td>
<td>20</td>
<td>140</td>
</tr>
<tr>
<td>Single-Phase</td>
<td>3500Ω</td>
<td>3200</td>
<td>20</td>
<td>64</td>
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<td>In-Phase Operation</td>
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<tr>
<td>Fig. 3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Series</td>
<td>15400Ω</td>
<td>14000</td>
<td>20</td>
<td>280</td>
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<tr>
<td>Single-Phase</td>
<td>700Ω</td>
<td>6400</td>
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<td>128</td>
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<td>In-Phase Operation</td>
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<td>Fig. 4</td>
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<tr>
<td>Half-Wave</td>
<td>8900Ω</td>
<td>10500</td>
<td>30</td>
<td>315</td>
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<tr>
<td>Three-Phase</td>
<td>4000Ω</td>
<td>4800</td>
<td>30</td>
<td>144</td>
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<td>In-Phase Operation</td>
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<td>Fig. 5</td>
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<tr>
<td>Parallel</td>
<td>8900Ω</td>
<td>10500</td>
<td>60</td>
<td>630</td>
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<tr>
<td>Three-Phase</td>
<td>4000Ω</td>
<td>4800</td>
<td>60</td>
<td>288</td>
</tr>
<tr>
<td>Quadrature Operation</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Fig. 6</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Series</td>
<td>8600Ω</td>
<td>21000</td>
<td>30</td>
<td>630</td>
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<tr>
<td>Three-Phase</td>
<td>4000Ω</td>
<td>9600</td>
<td>30</td>
<td>288</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 7</td>
<td></td>
<td></td>
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<tr>
<td>Half-Wave</td>
<td>7700Ω</td>
<td>10100</td>
<td>36</td>
<td>364</td>
</tr>
<tr>
<td>Four-Phase</td>
<td>3500Ω</td>
<td>4600</td>
<td>40</td>
<td>404</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fig. 8</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Half-Wave</td>
<td>7700Ω</td>
<td>10500</td>
<td>36</td>
<td>399</td>
</tr>
<tr>
<td>Six-Phase</td>
<td>3500Ω</td>
<td>4800</td>
<td>40</td>
<td>420</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For maximum peak inverse anode voltage of 22000 volts and maximum average current of 10 amperes.

For maximum peak inverse anode voltage of 10000 volts and maximum average current of 10 amperes.

**JULY 1, 1955**

**TUBE DIVISION**

**DATA 2**
HALF-WAVE MERCURY-VAPOR RECTIFIER

ANODE
.625" MIN.
SKIRTED LARGE CAP
JETEC N° CI-10
2.230"
7 1/8 MAX. DIA.

GT56 BULB

ZONE WHERE
CONDENSED-MERCURY
TEMPERATURE SHOULD
BE MEASURED

TERMINAL-SUPPORT
SHELL
JETEC N° FO-2

F1 = FILAMENT (INSULATED)
F2 = FILAMENT, CATHODE SHIELD,
AND SHELL (ANODE RETURN)

JULY 1, 1955
JUNE 27, 1955
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
CE-4649R3
HALF-WAVE MERCURY-VAPOR RECTIFIER

TERMINAL-SUPPORT SHELL

SIZE AND SHAPE OF HOLES MAY VARY OR THEY MAY BE OMITTED

NON-INSULATED BUSHING

INSULATED BUSHING

0.500" - 1.675"

0.281"

0.000" - 0.406"

1.063" MAX.

4.063" - 4.375"

JETEC No. FO-2

RCA No. 3911

JULY 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
### Curve Table

<table>
<thead>
<tr>
<th>Curve</th>
<th>E\textsubscript{f} Volts RMS</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.75</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>5.25</td>
<td>FULL</td>
</tr>
</tbody>
</table>

**Rate of Rise of Condensed Mercury Temperature**

**Minimum Allowable Heating Time Before Load Application**

**Heating Time (Minutes)**

- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70

**Temperature Rise of Condensed Mercury Above Ambient Temperature (°C)**

- 0
- 2
- 4
- 6
- 8
- 10
- 12
- 14
- 16

**Graphical Representation**

- The graph shows the relationship between heating time (minutes) and temperature rise (°C) for different loads.
- The solid line represents the no-load condition, while the dashed line represents the full-load condition.

---

**Additional Information**

- The graph is a representation of the rate of rise of condensed mercury temperature under different conditions.
- The heating time before load application is a critical factor to consider for proper operation.

---

**Note:**

- This document is from RCA, specifically for type 857-B tubes, focusing on the heating characteristics and temperature rise under various conditions.
TRANSMITTING TRIODE

Typical Operation:

<table>
<thead>
<tr>
<th></th>
<th>12000</th>
<th>15000</th>
<th>18000</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td></td>
<td></td>
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<tr>
<td>D-C Grid Voltage</td>
<td>-800</td>
<td>-900</td>
<td>-1000</td>
</tr>
<tr>
<td>Peak R-F Grid Voltage</td>
<td>2050</td>
<td>2300</td>
<td>2550</td>
</tr>
<tr>
<td>D-C Plate Current</td>
<td>6.25</td>
<td>7.5</td>
<td>8.33</td>
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<tr>
<td>D-C Grid Current #</td>
<td>0.8</td>
<td>0.85</td>
<td>0.9</td>
</tr>
<tr>
<td>Driving Power #</td>
<td>1.6</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Power Output</td>
<td>50</td>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>

# Subject to wide variations as explained on sheet TUBE RATING in General Section.

Data on operating frequencies for the 862-A are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.
TRANSMITTING TRIODE

STRANDED CABLE
1/2" DIA. APPROX.

FILAMENT

FLEXIBLE RIBBON
1 1/4" X .015" APPROX.

RIGID GRID

NR3608 BASE

1 1/6 MAX.

4 MAX.

4 1/2 MAX.

6 1/2 MAX.

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HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:
Filament, Coated:

<table>
<thead>
<tr>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.38</td>
<td>2.5</td>
<td>2.62</td>
</tr>
</tbody>
</table>

Voltage at 2.5 volts...
Current at 2.5 volts...
Heating time at rated voltage...
Peak Tube Voltage Drop (Approx.)...

Mechanical:
Operating Position...
Maximum Overall Length...
Maximum Seated Length...
Maximum Diameter...
Weight (Approx.)...
Bulb...
Cap...
Socket...
Base...

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under Maximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):

*No load*...
*Full load*

*Indicates a change.

Electrical and mechanical data are also provided for the filament, coated voltage, current, heating time, peak tube voltage drop, and mechanical specifications such as operating position, maximum overall length, maximum seated length, maximum diameter, and weight. The temperature control section explains the conditions for heating and cooling, and the temperature rise of condensed mercury.
### HALF-WAVE RECTIFIER

**Maximum Ratings, Absolute Values:** For supply frequency of 60 cps

**Operating Condensed-Mercury-Temperature Range:**
- 20° to 80° C
- 20° to 70° C
- 20° to 60° C

<table>
<thead>
<tr>
<th>PEAK INVERSE ANODE VOLTAGE</th>
<th>2500 max.</th>
<th>5000 max.</th>
<th>10000 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAK ANODE CURRENT</td>
<td>2 max.</td>
<td>1 max.</td>
<td>1 max. amp</td>
</tr>
<tr>
<td>Average</td>
<td>0.5 max.</td>
<td>0.25 max.</td>
<td>0.25 max. amp</td>
</tr>
<tr>
<td>Fault, for duration of</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1 second maximum</td>
<td>20 max.</td>
<td>20 max.</td>
<td>20 max. amp</td>
</tr>
</tbody>
</table>

*Operation at 80° ± 5° C is recommended.

# Averaged over any interval of 30 seconds maximum.

### OPERATING CONSIDERATIONS

*Shields and rf filter circuits should be provided for the 866-A if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.*
<table>
<thead>
<tr>
<th>CIRCUIT</th>
<th>MAX. TRANS. SEC. VOLTS (RMS) E</th>
<th>APPROX. DC OUTPUT VOLS TO FILTER $E_{av}$</th>
<th>MAX. DC OUTPUT AMPERES $i_{av}$</th>
<th>MAX. DC OUTPUT KW $P_{dc}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 1</td>
<td>Half-Wave Single-Phase In-Phase Operation</td>
<td>7000 3500 1700</td>
<td>3200 1600 800</td>
<td>0.25 0.25 0.5</td>
</tr>
<tr>
<td>Fig. 2</td>
<td>Full-Wave Single-Phase In-Phase Operation</td>
<td>3500 1700 800</td>
<td>3200 1600 800</td>
<td>0.5 0.5 1</td>
</tr>
<tr>
<td>Fig. 3</td>
<td>Series Single-Phase In-Phase Operation</td>
<td>7000 3500 1700</td>
<td>6400 3200 1600</td>
<td>0.5 0.5 1</td>
</tr>
<tr>
<td>Fig. 4</td>
<td>Half-Wave Three-Phase In-Phase Operation</td>
<td>4000 2000 1000</td>
<td>4800 2400 1200</td>
<td>0.75 0.75 1.5</td>
</tr>
<tr>
<td>Fig. 5</td>
<td>Parallel Three-Phase Quadrature Operation</td>
<td>4000 2000 1000</td>
<td>4800 2400 1200</td>
<td>1.5 1.5 3</td>
</tr>
<tr>
<td>Fig. 6</td>
<td>Series Three-Phase Quadrature Operation</td>
<td>4000 2000 1000</td>
<td>9600 4800 2400</td>
<td>0.75 0.75 1.5</td>
</tr>
<tr>
<td>Fig. 7</td>
<td>Half-Wave Four-Phase Quadrature Operation</td>
<td>3500 1700 800</td>
<td>4500 2300 1100</td>
<td>0.91 0.91 1.82</td>
</tr>
<tr>
<td>Fig. 8</td>
<td>Half-Wave Six-Phase Quadrature Operation</td>
<td>3500 1700 800</td>
<td>4800 2400 1200</td>
<td>0.95 0.95 1.9</td>
</tr>
</tbody>
</table>

For maximum peak inverse anode voltage of 10000 volts, and condensed-mercury-temperature range of 20° to 60°C.
For maximum peak inverse anode voltage of 5000 volts, and condensed-mercury-temperature range of 20° to 70°C.
For maximum peak inverse anode voltage of 2500 volts, and condensed-mercury-temperature range of 20° to 80°C.
HALF-WAVE MERCURY-VAPOR RECTIFIER

ZONE WHERE CONDENSED-MERCURY TEMPERATURE SHOULD BE MEASURED

MEDIUM-SHELL SMALL 4-PIN BAYONET BASE JETEC No. A4-10

RATE OF RISE OF CONDENSED-MERCURY TEMPERATURE

<table>
<thead>
<tr>
<th>CURVE</th>
<th>E_f VOLTS RMS</th>
<th>LOAD AMPERES</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>2.38</td>
<td>0</td>
</tr>
<tr>
<td>-</td>
<td>2.62</td>
<td>0.5</td>
</tr>
</tbody>
</table>

TEMPERATURE RISE OF CONDENSED MERCURY ABOVE AMBIENT TEMPERATURE °C

HEATING TIME MINUTES
HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:
Filamentary Cathode, Coated:
Voltage ................... 5 ± 5% ............... ac volts
Current ................... 19 ............... amperes
Minimum Heating Time at Rated Voltage .... 60 ............... seconds
Peak Tube Voltage Drop (Approx.) ........ 15 ............... volts

Mechanical:
Terminal Connections:
F1—Filament, Cathode Shield (Anode Return)
F2—Filament Cap—Anode

Mounting Position .... Vertical with filament end down
Overall Length ........ 14-1/4" ± 3/16"
Maximum Diameter .......... 5-1/8"
Bulb ......................... GT-40
Cap .................. Skirted Large
Base ....................... RCA No.3502

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under Maximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):*
No Load ....................... 15 °C
Full Load .................... 20 °C

HALF-WAVE RECTIFIER—In-Phase Operation

Maximum Ratings, Absolute Values: For supply frequency of 60 cps
Operating Condensed-Mercury Temperature Range
20° to 40°C
PEAK INVERSE ANODE VOLTAGE 10000 max. 15000 max. 20000 max. volts

*: See next page.

NOV. 1, 1952
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
HALF-WAVE MERCURY-VAPOR RECTIFIER

Operating Condensed-Mercury Temperature Range
30° to 60°C
30° to 50°C
30° to 40°C

ANODE CURRENT:
Peak ........................................ 10 max. 10 max. 10 max. amp
Average* .................................... 2.5 max. 2.5 max. 2.5 max. amp
Fault, for duration of 0.1 second max. 100 max. 100 max. 100 max. amp

HALF-WAVE RECTIFIER—Quadrature Operation**

Maximum Ratings, Absolute Values: For supply frequency of 60 cps

Operating Condensed-Mercury Temperature Range
30° to 60°C
30° to 50°C
30° to 40°C

PEAK INVERSE
ANODE VOLTAGE 10000 max. 15000 max. 20000 max. volts
ANODE CURRENT:
Peak ........................................ 20 max. 20 max. 10 max. amp
Average* .................................... 5 max. 5 max. 2.5 max. amp
Fault, for duration of 0.1 second max. 100 max. 100 max. 100 max. amp

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>1</td>
<td>21   amp</td>
</tr>
<tr>
<td>Critical Anode Voltage</td>
<td>2</td>
<td>2</td>
<td>100  volts</td>
</tr>
<tr>
<td>Peak Tube Voltage Drop</td>
<td>3</td>
<td>3</td>
<td>17   volts</td>
</tr>
</tbody>
</table>

Note 1: With 5 volts rms on filament.
Note 2: With 4.75 volts rms on filament, and condensed-mercury temperature at 30°C.
Note 3: With 5 volts rms on filament, condensed-mercury temperature of 35°±5°C, peak anode current of 50 amperes provided by half-cycle pulse from a 60-cps sine wave and recurring approximately once a second. Tube drop is measured by an oscilloscope connected between anode and center tap of filament transformer.

* With filament volts = 4.75 and no heat-conserving enclosure.
** Filament voltage out of phase (60° to 120°) with anode voltage.

OPERATING NOTES

X-Ray Warning. X-rays are produced when the 869-B is operated with a peak inverse anode voltage above 16000 volts (absolute value). These rays can constitute a health hazard unless the tube is adequately shielded for x-ray radiation.

NOV. 1, 1952 TUBE DEPARTMENT RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
### HALF-WAVE MERCURY-VAPOR RECTIFIER

For Circuit Figures, see Front of this Section

<table>
<thead>
<tr>
<th>CIRCUIT</th>
<th>MAX. TRANS. SEC. VOLTS (RMS)</th>
<th>APPROX. DC OUTPUT VOLTS TO FILTER $E_{av}$</th>
<th>MAX. DC OUTPUT AMPERES $I_{av}$</th>
<th>MAX. DC OUTPUT KW $P_{dc}$</th>
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<tbody>
<tr>
<td>Fig. 1</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Half-Wave</td>
<td>14000$^D$</td>
<td>6300</td>
<td>2.5</td>
<td>16</td>
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<tr>
<td>Single-Phase</td>
<td>10600$^A$</td>
<td>4700</td>
<td>2.5</td>
<td>12</td>
</tr>
<tr>
<td>In-Phase Operation</td>
<td>7000$^A$</td>
<td>3100</td>
<td>2.5</td>
<td>8</td>
</tr>
<tr>
<td>Fig. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-Wave</td>
<td>7000$^D$</td>
<td>6300</td>
<td>5.0</td>
<td>32</td>
</tr>
<tr>
<td>Single-Phase</td>
<td>5300$^A$</td>
<td>4700</td>
<td>5.0</td>
<td>24</td>
</tr>
<tr>
<td>In-Phase Operation</td>
<td>3500$^A$</td>
<td>3100</td>
<td>5.0</td>
<td>16</td>
</tr>
<tr>
<td>Fig. 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Series</td>
<td>14000$^D$</td>
<td>12700</td>
<td>5.0</td>
<td>64</td>
</tr>
<tr>
<td>Single-Phase</td>
<td>10600$^A$</td>
<td>9500</td>
<td>9.0</td>
<td>48</td>
</tr>
<tr>
<td>In-Phase Operation</td>
<td>7000$^A$</td>
<td>6300</td>
<td>5.0</td>
<td>32</td>
</tr>
<tr>
<td>Fig. 4</td>
<td></td>
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<tr>
<td>Half-Wave</td>
<td>8100$^D$</td>
<td>9500</td>
<td>7.5</td>
<td>72</td>
</tr>
<tr>
<td>Three-Phase</td>
<td>6100$^A$</td>
<td>7100</td>
<td>7.5</td>
<td>54</td>
</tr>
<tr>
<td>In-Phase Operation</td>
<td>4000$^D$</td>
<td>4700</td>
<td>7.5</td>
<td>36</td>
</tr>
<tr>
<td>Fig. 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel</td>
<td>8100$^D$</td>
<td>9500</td>
<td>15.0</td>
<td>143</td>
</tr>
<tr>
<td>Three-Phase</td>
<td>6100$^A$</td>
<td>7100</td>
<td>30.0</td>
<td>215</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td>4000$^D$</td>
<td>4700</td>
<td>30.0</td>
<td>143</td>
</tr>
<tr>
<td>Fig. 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Series</td>
<td>8100$^D$</td>
<td>19000</td>
<td>7.5</td>
<td>143</td>
</tr>
<tr>
<td>Three-Phase</td>
<td>6100$^A$</td>
<td>14200</td>
<td>15.0</td>
<td>215</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td>4000$^D$</td>
<td>9500</td>
<td>15.0</td>
<td>143</td>
</tr>
<tr>
<td>Fig. 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half-Wave</td>
<td>7000$^D$</td>
<td>9000</td>
<td>9.0</td>
<td>81</td>
</tr>
<tr>
<td>Four-Phase</td>
<td>5300$^A$</td>
<td>6700</td>
<td>18.0</td>
<td>121</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td>3500$^A$</td>
<td>4500</td>
<td>18.0</td>
<td>81</td>
</tr>
<tr>
<td>Fig. 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Half-Wave</td>
<td>7000$^D$</td>
<td>9500</td>
<td>9.5</td>
<td>91</td>
</tr>
<tr>
<td>Six-Phase</td>
<td>5300$^A$</td>
<td>7100</td>
<td>19.0</td>
<td>136</td>
</tr>
<tr>
<td>Quadrature Operation</td>
<td>3500$^A$</td>
<td>4700</td>
<td>19.0</td>
<td>91</td>
</tr>
</tbody>
</table>

For maximum peak inverse anode voltage of 20000 volts, and condensed-mercury-temperature range of 30°C to 60°C.

* For maximum peak inverse anode voltage of 15000 volts, and condensed-mercury-temperature range of 30°C to 50°C.

** For maximum peak inverse anode voltage of 10000 volts, and condensed-mercury-temperature range of 30°C to 60°C.

NOV. 1, 1952  TUBE DEPARTMENT  RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
HALF-WAVE MERCURY-VAPOR RECTIFIER

ANODE

SKIRTED LARGE CAP
JETEC NO. C1-9
RCA NO. 3905

GT40 BULB

ZONE WHERE
CONDENSED-MERCURY
TEMPERATURE SHOULD
BE MEASURED

RCA ELECTRON TUBE

F1 = FILAMENT AND CATHODE
SHIELD (ANODE RETURN)
F2 = FILAMENT

92CM-4330R4

NOV. 1, 1952
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:
- Filament, Coated:
  - Voltage: Min. 4.75, Av. 5, Max. 5.25 ac volts
  - Current at 5 volts: ~ 7.5 amp
  - Heating time at rated voltage: ~ 90 sec
  - Peak Tube Voltage Drop (Approx.): ~ 10 volts

Mechanical:
- Operating Position: Vertical, base down
- Overall Length: 8-1/4" ± 1/4"
- Maximum Diameter: 2-5/16"
- Weight (Approx.): 7 oz
- Bulb: Medium (JETEC No.C1-5)
- Cap: Johnson No.123-211, or equivalent
- Socket Base: Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JETEC No.A4-29)

Basing Designation for BOTTOM VIEW: 4AT
- Pin 1—No Connection
- Pin 2—Filament, Cathode
- Pin 3—No Connection
- Pin 4—Filament Cap—Anode

Temperature Control:

Heating—When the ambient temperature is so low that the normal rise of condensed-mercury temperature above the ambient temperature will not bring the condensed-mercury temperature up to the minimum value of the operating ranges specified under Maximum Ratings, some form of heat-conserving enclosure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the maximum value of the operating condensed-mercury-temperature range is exceeded, provision should be made for forced-air cooling sufficient to prevent exceeding the maximum value.

Temperature Rise of Condensed Mercury to Equilibrium Above Ambient Temperature (Approx.):
- No load*: 14 °C
- Full load*: 19 °C

* With 4.75 volts rms on filament, and no heat-conserving enclosure.
* With 5.25 volts rms on filament, average anode current = 1.25 amperes, and no heat-conserving enclosure.
HALF-WAVE MERCURY-VAPOR RECTIFIER

HALF-WAVE RECTIFIER

Maximum Ratings, Absolute Values: For supply frequency of 60 cps

Operating Condensed-Mercury-
Temperature Range

- 20° to 70° C
- 20° to 60° C

PEAK INVERSE ANODE
VOLTAGE ........ 5000 max. 10000 max. volts

ANODE CURRENT:
PeaK ........ 5 max. 5 max. amp

Average* ....... 1.25 max. 1.25 max. amp

Fault, for duration
of 0.1 second maximum. 50 max. 50 max. amp

* Operation at 40° ± 5° C is recommended.

Averaged over any interval of 15 seconds maximum.

OPERATING CONSIDERATIONS

Shields and rf filter circuits should be provided for the 872-A if it is subjected to extraneous high-frequency fields during operation. These fields tend to produce breakdown effects in mercury vapor and are detrimental to tube life and performance. When shields are used, special attention must be given to providing adequate ventilation and to maintaining normal condensed-mercury temperature. Rf filters are employed to prevent damage caused by rf currents which might otherwise be fed back into the rectifier tubes.

--- Indicates a change.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
## Half-Wave Mercury-Vapor Rectifier

For Circuit Figures, see Front of this Section

<table>
<thead>
<tr>
<th>CIRCUIT</th>
<th>MAX. TRANS. SEC. VOLTS (RMS)</th>
<th>APPROX. DC OUTPUT VOLTS TO FILTER $E_{av}$</th>
<th>MAX. DC OUTPUT AMPERES $I_{av}$</th>
<th>MAX. DC OUTPUT KW TO FILTER $P_{dc}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 1</td>
<td>7000$^a$ 3500$^a$</td>
<td>3200 1600</td>
<td>1.25 1.25</td>
<td>4 2</td>
</tr>
<tr>
<td>Half-Wave Single-Phase</td>
<td>In-Phase Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 2</td>
<td>3500$^a$ 1700$^a$</td>
<td>3200 1600</td>
<td>2.5 2.5</td>
<td>8 4</td>
</tr>
<tr>
<td>Full-Wave Single-Phase</td>
<td>In-Phase Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 3</td>
<td>7000$^a$ 3500$^a$</td>
<td>6400 3200</td>
<td>2.5 2.5</td>
<td>16 8</td>
</tr>
<tr>
<td>Series Single-Phase</td>
<td>In-Phase Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 4</td>
<td>4000$^a$ 2000$^a$</td>
<td>4800 2400</td>
<td>3.75 3.75</td>
<td>18 9</td>
</tr>
<tr>
<td>Half-Wave Three-Phase</td>
<td>In-Phase Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 5</td>
<td>4000$^a$ 2000$^a$</td>
<td>4800 2400</td>
<td>7.5 7.5</td>
<td>36 18</td>
</tr>
<tr>
<td>Parallel Three-Phase</td>
<td>Quadrature Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 6</td>
<td>4000$^a$ 2000$^a$</td>
<td>9600 4800</td>
<td>3.75 3.75</td>
<td>36 18</td>
</tr>
<tr>
<td>Series Three-Phase</td>
<td>Quadrature Operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fig. 7</td>
<td>3500$^a$ 1700$^a$</td>
<td>4500 2250</td>
<td>Resis-Inductive Load 4.5 5</td>
<td>Resis-Inductive Load 20 22.5</td>
</tr>
<tr>
<td>Half-Wave Four-Phase</td>
<td>Quadrature Operation</td>
<td>Resis-Inductive Load 4.5 5</td>
<td>Resis-Inductive Load 10 11.2</td>
<td></td>
</tr>
<tr>
<td>Fig. 8</td>
<td>3500$^a$ 1700$^a$</td>
<td>4800 2400</td>
<td>Resis-Inductive Load 4.75 5</td>
<td>Resis-Inductive Load 22.8 24</td>
</tr>
<tr>
<td>Half-Wave Six-Phase</td>
<td>Quadrature Operation</td>
<td>Resis-Inductive Load 4.75 5</td>
<td>Resis-Inductive Load 11.4 12</td>
<td></td>
</tr>
</tbody>
</table>

For maximum peak inverse anode voltage of 10000 volts and condensed-mercury-temperature range of 20° to 600 C.

For maximum peak inverse anode voltage of 5000 volts and condensed-mercury-temperature range of 20° to 700 C.
HALF-WAVE MERCURY-VAPOR RECTIFIER

RATE OF RISE OF CONDENSED-MERCURY TEMPERATURE

<table>
<thead>
<tr>
<th>CURVE</th>
<th>E.f. VOLTS RMS</th>
<th>LOAD AMPERES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.75</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5.25</td>
<td>1.25</td>
</tr>
</tbody>
</table>

TEMPERATURE RISE OF CONDENSED MERCURY ABOVE AMBIENT TEMPERATURE—°C

HEATING TIME—MINUTES

ELECTRON TUBE DIVISION
RCA CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CS-9029
HALF-WAVE HIGH-VACUUM RECTIFIER

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Coated Voltage</td>
<td>2.5 a-c volts</td>
</tr>
<tr>
<td>Current</td>
<td>5.0 amp.</td>
</tr>
<tr>
<td>Maximum Overall Length</td>
<td>6-13/16&quot;</td>
</tr>
<tr>
<td>Maximum Diameter</td>
<td>2-1/16&quot;</td>
</tr>
<tr>
<td>Bulb T-16</td>
<td></td>
</tr>
<tr>
<td>Cap Medium Metal</td>
<td></td>
</tr>
<tr>
<td>Base Medium 4-Pin, Bayonet</td>
<td>Stock No. 9937</td>
</tr>
</tbody>
</table>

**Maximum Ratings Are Absolute Values**

**MAXIMUM RATINGS**

- Peak Inverse Voltage: 5500 max. volts
- Peak Plate Current: 0.8 max. amp.
- Surge Current: 2.5 max.* amp.
- Average Plate Current: 0.13 max. amp.

* Equipment should be designed so that this value is not exceeded during switching operations.

† Should not deviate more than ±5% from the rated value.

**AVERAGE PLATE CHARACTERISTIC**

![Graph of Average Plate Characteristic](image_url)

May 1, 1942

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.
HALF-WAVE HIGH-VACUUM RECTIFIER

CAP
550"-.376" OIA.

TIE BULB

MEDIUM 4-PIN BAYONET BASE

92C-6156

BOTTOM VIEW OF SOCKET CONNECTIONS

AA' = PLAN OF ELECTRODES

F - Filament
NC - No Connection
P - Plate

TUBE MOUNTING POSITION

VERTICAL: Base down
HORIZONTAL: Plate in vertical plane (on edge)

May 1, 1942
RCA RADIotron DIVISION
RCA MANUFACTURING COMPANY INC.
Super-Power Triode

5 MW PEAK POWER OUTPUT IN LONG-PULSE SERVICE AT 440 MHz

CERAMIC-METAL SEALS
INTEGRAL WATER DUCTS
DOUBLE-ENDED CONSTRUCTION
17.00 INCH MAX. LENGTH
COAXIAL-ELECTRODE STRUCTURE
14.125 INCH MAX. DIAMETER

WATER COOLED
For Use as a Plate-Pulsed Amplifier at Frequencies up to 605 MHz, for Long Range Search Radar, Pulsed Transmission in Communications Service, and Particle Accelerator Service.

ELECTRICAL
Filamentary Cathode, Multistrand Thoriated Tungsten

Current (DC):
Typical operating range value ........ 6800 to 7200 A
Maximum range value ................... 7000 to 7400 A
Maximum value for starting, even momentarily .................. 2000 A
Minimum time to reach operating current ............. 30 s
Minimum time at normal operating current before plate voltage is applied 60 s

Voltage (DC):
Typical range value for prescribed operating current .......... 3.6 to 4.5 V
Maximum value under any condition .................. 4.65 V

Direct Interelectrode Capacitances
Grid to plate .................. 150 pF
Grid to cathode ............. 1600 pF
Plate to cathode ............ less than 1.0 pF

MECHANICAL
Operating Position .......... Tube axis vertical, either end up
Overall Length ............. 17.00 max in
Maximum Diameter .......... 14.125 max in
Terminal Connections .. See Dimensional Outline

Weight
Uncrated .................. 175 lb
Crated .................. 340 lb

THERMAL
Ceramic-Bushing Temperature ........ 150 max °C
Metal-Surface Temperature ........ 150 max °C
Minimum Storage Temperature ........ -65 min °C

Water Flow

<table>
<thead>
<tr>
<th>Flow</th>
<th>Type</th>
<th>Min.</th>
<th>Flow</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>g/a</td>
<td>g/a</td>
<td>psi</td>
<td>Time</td>
</tr>
<tr>
<td>Top to plate, total flow for two parallel input and output coolant courses</td>
<td>160</td>
<td>150</td>
<td>45 max</td>
<td></td>
</tr>
<tr>
<td>To upper grid coolant course</td>
<td>3</td>
<td>2</td>
<td>25 max</td>
<td></td>
</tr>
<tr>
<td>To lower coolant course</td>
<td>3</td>
<td>2</td>
<td>25 max</td>
<td></td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 1
6-66
Water Flow (cont'd)

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Typ. Flow (g/m)</th>
<th>Absolute Min. Flow (g/m)</th>
<th>Pressure Differential for Typ. Flow (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To grid cathode coolant course</td>
<td>35</td>
<td>30</td>
<td>30 max</td>
</tr>
<tr>
<td>Resistivity of water at 25°C: Plate and grid water</td>
<td></td>
<td>1 min</td>
<td>MΩ-cm</td>
</tr>
<tr>
<td>Grid-cathode water</td>
<td></td>
<td>5 min</td>
<td>MΩ-cm</td>
</tr>
<tr>
<td>Water temperature from any outlet</td>
<td></td>
<td>70 max</td>
<td>°C</td>
</tr>
<tr>
<td>External gas pressured</td>
<td></td>
<td>65 max</td>
<td>psi</td>
</tr>
<tr>
<td>Gauge pressure at any inlet</td>
<td></td>
<td>90 max</td>
<td>psi</td>
</tr>
</tbody>
</table>

**TERMINAL DIAGRAM (Bottom View)**

- FI - Filament Terminal (Inner)
- FO - Filament Terminal (Outer)
- KURF - Upper RF Cathode Terminal
- KLRF - Lower RF Cathode Terminal
- GUIRF - Upper RF Grid Input Terminal
- GUORF - Upper RF Grid Output Terminal
- GLIRF - Lower RF Grid Input Terminal
- GLORF - Lower RF Grid Output Terminal
- PLRF - Lower RF Plate Terminal
- PURF - Upper RF Plate Terminal

**PLATE-PULSED AMPLIFIER—Class B**

*For a maximum "ON" time of 2200 microseconds in any 34000-microsecond interval*

**Absolute-Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 450 MHz</th>
<th>Up to 605 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>34</td>
<td>25 kV</td>
</tr>
<tr>
<td>Peak Negative Grid Voltage</td>
<td>150</td>
<td>150 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>300</td>
<td>300 A</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>600</td>
<td>600 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>19.5</td>
<td>19.5 A</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>39</td>
<td>39 A</td>
</tr>
<tr>
<td>Plate Input (Average)</td>
<td>664</td>
<td>487 kW</td>
</tr>
<tr>
<td>Plate Dissipation (Average)</td>
<td>300</td>
<td>300 kW</td>
</tr>
</tbody>
</table>

**Typical Operation**

*With rectangular wave shape in cathode-drive circuit with duty factor of 0.06 and pulse duration of 2000 microseconds*

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Up to 440 MHz</th>
<th>Up to 550 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive Pulse Plate-to-Grid</td>
<td>30</td>
<td>33</td>
</tr>
<tr>
<td>Peak Cathode-to-Grid Voltage</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>285</td>
<td>295</td>
</tr>
</tbody>
</table>

**DATA 1**

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
### Absolute-Maximum Ratings

For a maximum "ON" time of 10000 microseconds in any 155000-microsecond interval

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>At 440 MHz</th>
<th>At 550 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Cathode Current</td>
<td>570 A</td>
<td>590 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>17.1 A</td>
<td>17.7 A</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>34.2 A</td>
<td>35.4 A</td>
</tr>
<tr>
<td>Peak Driving Power Output</td>
<td>170 kW</td>
<td>200 kW</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse (Approx.)</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.5 MW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Typical Operation

With rectangular wave shape in cathode-drive circuit at 440 MHz with duty factor of 0.06 and pulse duration of 1000 microseconds

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate-to-Grid Voltage</td>
<td>28 kV</td>
</tr>
<tr>
<td>Peak Negative Grid Voltage</td>
<td>150 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>250 A</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>500 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>16.25 A</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>32.5 A</td>
</tr>
<tr>
<td>Plate Input (Average)</td>
<td>45.5 kW</td>
</tr>
<tr>
<td>Plate Dissipation (Average)</td>
<td>200 kW</td>
</tr>
</tbody>
</table>

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Strap-Resonant Frequency</td>
<td>90 - 140 MHz</td>
</tr>
<tr>
<td>Output Strap-Resonant Frequency</td>
<td>300 - 340 MHz</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>4 - N MW</td>
</tr>
</tbody>
</table>

**Note 1:** For conditions with filament current at prescribed typical operating value supplied with the tube, see footnotes (a), (b), (c). Peak positive-pulse plate-to-grid voltage = 32000 max. volts, peak current = 18 max. amperes, frequency = 400 to 450 MHz, pulse duration = 2000 microseconds, duty factor = 0.06, and peak pulse driving power = 220000 max. watts.

---

(a) The typical and maximum operating filament currents recommended for each tube are specified on a label attached to the outside diameter of the plate terminal of each tube. The specified maximum filament current for each tube is the maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube rating, the filament current should...
be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of tube life.

Considerations

Measured between KLRF and KURF (See Terminal Diagram).

Measured directly across cooled element for the indicated typical flow.

With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

"OF" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 50% of the peak power value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 100 microseconds. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

Under most conditions pressurized cavities will be required for operation at the indicated typical voltages to prevent flash-over at the tube seals.

Peak cathode current is the total of the peak plate current and the peak rectified grid current. (Pulses are not coincident, hence they cannot be added arithmetically).

Duty factor is the product of the pulse duration and repetition rate.

Preferably obtained from a cathode bias resistor.

The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, and in initial tube characteristics during life.

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

See Electrical Considerations - Filament or Heater.

See Cooling Considerations - Forced-Air Cooling.

See Cooling Considerations - Liquid Cooling.

See Classes of Service.

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

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

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
DATA 3
6-66
High-Mu Triode

CERAMIC-METAL PENCIL TYPE

FAST WARM-UP TIME
FAST HEAT DISSIPATION

For use in plate-pulsed operation as a power amplifier, oscillator, and frequency multiplier in compact mobile and aircraft equipment at frequencies up to 4 Gc/s and above and at altitudes up to 25,000 feet without pressurization.

ELECTRICAL

Heater, for Unipotential Cathode
Voltage (AC or DC) .................... 6.3 ± 10% V
Current at 6.3 V ..................... 0.300 A
Cathode Warmup Time (Average) to reach 60% of operating plate current ..................... 10 s
DC plate supply volts = 80, grid volts = 0, cathode resistor = 0 Ω, load resistor = 10 Ω, heater volts = 6.3
Amplification Factor .................. 70
Transconductance ................... 22500 µmhos
DC plate mA = 14, dc plate volts = 125, cathode resistor = 50 Ω
Direct Interelectrode Capacitances
Grid to plate ......................... 2.0 pF
Grid to cathode and heater .......... 5.8 pF
Plate to cathode and heater .......... 0.08 max pF

MECHANICAL

Operating Position .................... Any
Dimensions and Terminal Connections  See accompanying Dimensional Outline
Weight (Approx.) ...................... 0.3 oz
Sockets
Heater-Terminals Connector ........ Greyh111 No. 22-5, or equivalent
Socket for operation up to about 550 Mc/s (Including heater-terminals connector) ........ Jettronb No. CD7010, or equivalent
Cavities (Including heater-terminals connector) ....................... J-V-MC No. D-7980 Series, Resdel No. 10 Series, AML, Inc.© MCL, Inc.© or equivalent

Terminal Connections (see Dimensional Outline):

H - Heater Pin
K - Cathode Cylinder
(Adjacent to Heater Pins)
G - Grid Flange
P - Plate Cylinder
(Adjacent to pinch-off)
**PLATE PULSED SERVICE—CLASS C**

**Absolute Maximum Ratings** (Up to 4 Gc/s)  
For a maximum “ON” time of 5 microseconds in any 5000-microsecond interval.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate-Supply Voltage</td>
<td>2000 V</td>
</tr>
<tr>
<td>Peak Plate Current from Pulse Supply</td>
<td>3.0 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.0 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>1.5 µs</td>
</tr>
<tr>
<td>Duty Factor</td>
<td>0.001</td>
</tr>
<tr>
<td>Plate-Seal Temperature</td>
<td>225 °C</td>
</tr>
</tbody>
</table>

**Typical Operation** as Oscillator with Rectangular Wave Shape in Cathode-Drive Circuit at 3.3 Gc/s  
With duty factor of 0.001 and pulse duration of 1 microsecond.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate-Supply Voltage</td>
<td>1750 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.5 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>1.0 mA</td>
</tr>
<tr>
<td>Grid Resistor</td>
<td>50 Ω</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse</td>
<td>1000 W</td>
</tr>
</tbody>
</table>

**Typical Operation** as Frequency Doubler to 1 Gc/s with Rectangular Wave Shape in Cathode-Drive Circuit.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate-Supply Voltage</td>
<td>1200 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.4 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>0.2 mA</td>
</tr>
<tr>
<td>Grid Resistor</td>
<td>2000 Ω</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>100 W</td>
</tr>
</tbody>
</table>

**RF POWER AMPLIFIER AND OSCILLATOR—CLASS C TELEGRAPHY**

**RF POWER AMPLIFIER—CLASS C FM TELEPHONY**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-50 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>35 mA</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>45 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>15 mA</td>
</tr>
<tr>
<td>Plate-Seal Temperature</td>
<td>225 °C</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>50 V</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>50 V</td>
</tr>
</tbody>
</table>

**Typical Operation** as RF Power Amplifier in Cathode-Drive Circuit at 550 Mc/s.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250 300 V</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-6.5 -9 V</td>
</tr>
<tr>
<td>Grid Resistor</td>
<td>500 700 Ω</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>31 35 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>13 13 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>0.2 0.2 W</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>4.8 6 W</td>
</tr>
</tbody>
</table>

**Grid-Circuit Resistance**  
Maximum Circuit Value  
0.25 MΩ
### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Heater Current</th>
<th>Direct Interelectrode Capacitances</th>
<th>Heater-Cathode Leakage Current</th>
<th>Plate Current (I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>Min</td>
<td>Max</td>
<td>Note</td>
</tr>
<tr>
<td></td>
<td>0.270</td>
<td>0.330</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate.</td>
<td>1.7</td>
<td>2.4</td>
<td>pF</td>
</tr>
<tr>
<td>Grid to cathode.</td>
<td>5.0</td>
<td>6.5</td>
<td>pF</td>
</tr>
<tr>
<td>Plate to cathode.</td>
<td>0.08</td>
<td></td>
<td>pF</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac or dc on heater.

Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.

Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.

Note 4: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

Note 5: With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 µf.

a) Graybill, Inc., 561 Hillgrove Ave., LaGrange, Ill.
b) Jettron Products, Inc., 56 Route 10, Hanover, N.J.
c) Fidelitone Microwave, Inc., JVM Division, 6415 N. Ravenna Wood Ave., Chicago, Ill. Indicated No. applies to a series of cavities covering the range from 220 to 3500 Mc/s.
d) Readel Engineering Corp., 330 South Fair Oaks Ave., Pasadena, Calif. This series of cavities covers the range from 215 to 2325 Mc/s.
e) Applied Microwave Laboratory, Inc., 106 Albion St., Wakefield, Mass.
f) Microwave Cavity Laboratory, Inc., 10 Beach Ave., LaGrange, Ill.

g) “ON” time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

h) In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the terminal to provide adequate heat conduction.

j) Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time “ON” to total elapsed time in any 5000-microsecond interval.

k) Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.

---

**OPERATING CONSIDERATIONS**

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.
The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum rated values shown in the tabulated data.

### GAUGES

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Type</th>
<th>Dimension</th>
<th>Radius R</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1-1</td>
<td>Go</td>
<td>0.25200&quot; +0.00000&quot; -0.00007&quot; 0.320&quot; +0.001&quot; -0.000&quot; 0.003&quot; Max</td>
<td></td>
</tr>
<tr>
<td>G1-2</td>
<td>No-Go</td>
<td>0.24500&quot; +0.00007&quot; -0.00000&quot;    -</td>
<td></td>
</tr>
<tr>
<td>G3-1</td>
<td>Go</td>
<td>0.55700&quot; +0.00000&quot; -0.00007&quot;    -</td>
<td></td>
</tr>
<tr>
<td>G3-2</td>
<td>No-Go</td>
<td>0.54700&quot; +0.00007&quot; -0.00000&quot;    -</td>
<td></td>
</tr>
</tbody>
</table>
Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular Surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular Surface "C" is on the side of the grid flange toward the plate cylinder.

Note 1: With annular surface "B" resting on reference plane "A". The axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch.

Note 4: The diameter along the 0.320 inch minimum length is measured with "GO" and "NO-GO" ring gauges G1-1 and G1-2, respectively.

Note 5: This diameter is measured with "GO" and "NO-GO" gauges G3-1 and G3-2, respectively.
**TYPICAL CATHODE-DRIVE POWER AMPLIFIER CIRCUIT**

![Cathode-Drive Power Amplifier Circuit Diagram]

**TYPICAL BROADBAND AMPLIFIER CIRCUIT**

![Broadband Amplifier Circuit Diagram]

- **C1**: 100 to 500 pF.
- **C2, C3, C4, C6, C7, C8, C9**: 0.8-8.5 pF
- Glass Dielectric Trimmers—JFD VC 20G or equivalent.
- **C5**: 500 pF.
- **J1, J2**: BNC Connectors.
- **L1, L2, L3, L4, L5, L6, L7**: For Frequency Range of:
  - 200-500 Mc/s—Two Turns, 1/2 inch Dia., Spaced 3/8 inch, Silver-Plated #14 Wire.
  - 500-1000 Mc/s—One Turn, 1/2 inch Dia., Silver-Plated #14 Wire.
- **RFC1, RFC2**: Ohmite Z-450 RF Chokes, or equivalent.
- **V**: RCA-4028A
Average Characteristics
CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
$I_b =$ PLATE CURRENT
$I_c =$ GRID CURRENT

PLATE (I_b) OR GRID (I_c) MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Average Constant-Current Characteristics

CATHODE-DRIVE SERVICE

$E_f = 6.3$ VOLTS
$\Sigma_C =$ GRID MILLIAMPERES
$\Sigma_D =$ PLATE MILLIAMPERES

DATA
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Typical Oscillator Power Output as a Function of Variations in Heater Voltage

AT 100% POWER OUTPUT:
DC PLATE-TO-GRID VOLTS = 200
DC PLATE MA. = 25

Plate-Seal Temperature as a Function of Ambient Temperature With Lumped-Constant Circuit

\( E_0 = 6.3 \text{ VOLTS} \)
LUMPED-CONSTANT SOCKET.
TRANSMITTING TRIODE

For oscillator applications requiring unusually stable characteristics

Heater - Coated Unipotential Cathode
Voltage 12.6 a-c or d-c volts
Current 0.25 amp.
Amplification Factor 5
Direct Inter-electrode Capacitances:
Grid to Plate 6.4 μf
Grid to Cathode 3.2 μf
Plates to Cathode 3-1/8 μf
Maximum Overall Length 3-6/16" 1-9/16" 3-9/16"
Bulb ST-12
Base Small Shell Octal, 8-Pin

MAXIMUM CCS RATINGS and TYPICAL OPERATING CONDITIONS

CCS = Continuous Commercial Service
R-F POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy

Key-down conditions per tube without modulation

D-C Plate Voltage 250 max. volts
D-C Grid Voltage -150 max. volts
D-C Plate Current 25 max. ma.
D-C Grid Current 8 max. ma.
Plate Input 6.2 max. watts
Plate Dissipation 5 max. watts
Typical Operation:
D-C Plate Voltage 280 volts
D-C Grid Voltage -14000 ohms
Peak R-F Grid Voltage 12000 volts
D-C Plate Current 105 volts
D-C Grid Current 5 approx. ma.
Driving Power 0.5 approx. watts
Power Output 4 approx. watts

In circuits where the cathode is not directly connected to the heater, the potential difference between heater and cathode should be kept as low as possible.

Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 15% of the carrier conditions.

Obtained from fixed supply (-70), by grid resistor (14,000), or cathode resistor (233), or by combination methods. When the 1626 is used in the final amplifier or a preceding stage of a transmitter designed for break-in operation and oscillator keying, a small amount of fixed bias must be used to maintain the plate current at a low value. With plate volts of 250, a fixed bias of at least -35 volts must be used.

Subject to wide variations as explained on sheet TRANS. TUBE RATINGS.

Registered trademark.

Data on operating frequencies for the 1626 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.
TRANSMITTING TRIODE

AVERAGE PLATE CHARACTERISTICS

TYPICAL CHARACTERISTICS

MARCH 15, 1941

RCA RADIOTRON DIVISION
RCA MANUFACTURING COMPANY, INC.
**High-Mu Triode**

**OCTAL-BASED PENCIL TUBE**

*For RF-Power-Amplifier, Oscillator, and Frequency-Multiplier Applications at Altitudes up to 100,000 Feet Without Pressurization*

*Replaces Type 2C40A in Most Applications*

**ELECTRICAL**

Heater, for Unipotential Cathode
- Voltage (AC or DC) \(6.3 \pm 10\%\) V
- Current at 6.3 volts 0.145 mA

Cathode Warmup Time to reach 90 percent of
- Typical oscillator power output 10 max s
- Operating dc plate current 15 max s

Amplification Factor 30

Transconductance for dc plate mA = 18
and dc plate volts = 250 5500 \(\mu\)hos

Direct Interelectrode Capacitances (Approx.)
- Grid to plate 1.1 pF
- Grid to cathode 1.8 pF
- Plate to cathode 0.05 max pF
- Cathode to rf cathode terminal 100 pF

**MECHANICAL**

Operating Position Any

Maximum Overall Length 3.125 in

Maximum Diameter 1.312 in

Base Small H-Wafer Octal 6-Pin (JEDEC Group f, No.86-108)

Terminal Connections  **BOTTOM VIEW**

- Pin 1-Do Not Use
- Pin 2-Heater
- Pin 3-Cathode
- Pin 5-Cathode
- Pin 7-Heater
- Pin 8-Cathode

**THERMAL**

Plate Seal Temperature 175 max °C

**CLASS A1 RF AMPLIFIER**

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

*For Altitudes up to 25000 ft*

- DC Plate Voltage 300 V
- DC Grid Voltage -100 V
- DC Plate Current 25 mA

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices

Harrison, N. J.

DATA 1 7-65
Plate Dissipation: 6.25 W

Peak Heater-Cathode Voltage
- Heater negative with respect to cathode: 90 V
- Heater positive with respect to cathode: 90 V

Maximum Circuit Value
- Grid-Circuit Resistance: 0.5 MΩ

RF POWER AMPLIFIER AND OSCILLATOR — CLASS C TELEGRAPHY

Key-down conditions per tube without amplitude modulation

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

For Altitudes up to 25000 ft

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 500</th>
<th>Value 2000</th>
<th>Value 3000</th>
<th>Value Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>262 V</td>
<td>262 V</td>
<td>262 V</td>
<td>4 V</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>12 V</td>
<td>2 V</td>
<td>2 V</td>
<td>1 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>23 mA</td>
<td>25 mA</td>
<td>25 mA</td>
<td>6 mA</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>3 mA</td>
<td>4 mA</td>
<td>4 mA</td>
<td>1 mA</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.45 W</td>
<td>0.45 W</td>
<td>0.45 W</td>
<td>0.1 W</td>
</tr>
</tbody>
</table>

As rf power amplifier in cathode-drive circuit at 500 Mc/s

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 500</th>
<th>Value 2000</th>
<th>Value 3000</th>
<th>Value Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>326 V</td>
<td>326 V</td>
<td>326 V</td>
<td>4 V</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>51 V</td>
<td>51 V</td>
<td>51 V</td>
<td>5 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>23 mA</td>
<td>23 mA</td>
<td>23 mA</td>
<td>6 mA</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>2 mA</td>
<td>2 mA</td>
<td>2 mA</td>
<td>1 mA</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>5 W</td>
<td>5 W</td>
<td>5 W</td>
<td>1 W</td>
</tr>
</tbody>
</table>

PLATE-MODULATED RF POWER AMPLIFIER — CLASS C TELEPHONY

Carper conditions per tube for use with a max modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values up to 2000 Mc/s

For Altitudes up to 25000 ft

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 500</th>
<th>Value 2000</th>
<th>Value 3000</th>
<th>Value Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>275 V</td>
<td>275 V</td>
<td>275 V</td>
<td>4 V</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>100 V</td>
<td>100 V</td>
<td>100 V</td>
<td>4 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>22 mA</td>
<td>22 mA</td>
<td>22 mA</td>
<td>5 mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>8 mA</td>
<td>8 mA</td>
<td>8 mA</td>
<td>2 mA</td>
</tr>
</tbody>
</table>
Plate Input .......................... 6 W
Plate Dissipation a .................... 4.25 W
Peak Heater-Cathode Voltage
Heater negative with respect to cathode 90 V
Heater positive with respect to cathode 90 V

Maximum Circuit Value
Grid-Circuit Resistance .............. 0.1 MΩ

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td></td>
<td>0.130</td>
<td>0.160</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td></td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Grid to cathode</td>
<td></td>
<td>1.5</td>
<td>2.1</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td></td>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td></td>
<td>1,2</td>
<td>50</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td></td>
<td>1,3</td>
<td>50</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td></td>
<td>1,4</td>
<td>22</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td></td>
<td>1,5</td>
<td>24.5</td>
</tr>
<tr>
<td>Transconductance</td>
<td></td>
<td>1,5</td>
<td>4000</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td></td>
<td>1,5</td>
<td>13.5</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td></td>
<td>1,6</td>
<td>55</td>
</tr>
<tr>
<td>Power Output</td>
<td></td>
<td>1,7</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac or dc on heater.
Note 2: With 100 volts dc between heater and cathode, heater negative with respect to cathode.
Note 3: With 100 volts dc between heater and cathode, heater positive with respect to cathode.
Note 4: With dc plate voltage of 250 volts, dc grid voltage of -2.5 volts, grid resistor of 0.5 megohms.
Note 5: With dc plate-supply voltage of 250 volts, cathode resistor of 200 ohms, and cathode bypass capacitor of 1000 microfarads.
Note 6: With dc plate voltage of 250 volts and dc grid voltage of -25 volts.
Note 7: With dc plate voltage of 250 volts, grid resistor adjusted to give a dc plate current of 25 milliamperes in a cavity-type oscillator operating at 1500 ± 25 megacycles per second.

In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the terminal to provide adequate heat conduction.

b Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 percent of the carrier conditions.

c Obtained from grid resistor.

SPECIAL TESTS AND PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test
This test (similar to MIL-E-1D, par. 4.9.12.1) is periodically performed on a sample lot of tubes. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 25,000 feet. Breakdown should not occur when a 60-cycle rms voltage
of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance

This test (similar to MIL-E-1D, par. 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.3 volts, dc plate-supply voltage of 250 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube should not exceed 100 millivolts.

High-Frequency Vibration Performance

This test (similar to MIL-E-1D, par. 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40-60 c/s and acceleration is 10 g. At the end of this test, tubes should not show temporary or permanent shorts or open circuits and should meet the following limits:

- Heater-Cathode Leakage Current: 50 max µA
  For conditions shown under Characteristics Range Values Notes 1,2 and 1,3.
- Low-Frequency Vibration (rms): 100 max mV
  For conditions shown above under Low-Frequency Vibration Performance.
- Transconductance: 3600 min µmhos
  For conditions shown under Characteristics Range Values Notes 1,5.

Shorts and Continuity Test

This test (similar to MIL-E-1D, par. 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test should be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in par. 4.7.7 of MIL-1-D, Amendment 5.

Glass Seal Fracture Tests

Fracture tests are performed on sample lots of subassemblies during manufacture.

1. Tubes (prior to final assembly) are placed on supports spaced 15/16 ± 1/64 inch apart with the grid flange centered
between these supports. Tubes should withstand gradual application, perpendicular to the tube axis, of a force of 30 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes (prior to final assembly) are held by clamping to the cathode cylinder. Tubes should withstand gradual application of a torque of 12.5 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

Dynamic Life Performance

This test (similar to MIL-E-1D, par. 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc/s under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, cathode resistor adjusted to give a plate current of 25 mA and value recorded, heater positive with respect to cathode by 100 volts, and plate-seal temperature of 175° C min.

At the end of 500 hours, the tube should not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limit.

Power Output ........................................ 0.2 min W

For conditions shown under Characteristics Range Values Notes 1, 7.

OPERATING CONSIDERATIONS

Mechanical

The maximum plate-seal temperature of 175° C is a tube rating and is to be observed in the same manner as other ratings. The temperature of the plate seal should be measured on the plate seal. The temperature may be measured with temperature-sensitive paint, such as Tempiak. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N. Y., in the form of a liquid or stick.

The mounting for the 4037A in cavity-type circuits should support the tube by the cathode cylinder which should make firm contact to the cavity surface. Connections to the grid flange and plate cylinder must be made by contacts with flexible leads to allow for variations in tube dimensions and eccentricities of the tube structure. In addition the plate connector should make firm, large-surface contact and be capable of conducting heat so that the plate-seal temperature will not exceed 175° C under any operating conditions. Contact should not be made to the 0.230-inch cap at the plate-terminal end of the tube as indicated on the Dimensional Outline.

Electrical

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not
connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.

**DIMENSIONAL OUTLINE**

- **PLATE TERMINAL**: 0.250 ± 0.005 MAX. DIA.
- **GRID TERMINAL**: 0.567 MAX. DIA.
- **CATHODE RF TERMINAL**: 1.025 ± 0.005 DIA.
- **BASE SKIRT**: 1.201 ± 0.010 MAX. DIA.
- **JEDEC GROUP I**: No.B6-I08
- **STIPPLED REGION (NOTE I)**

**DIMENSIONS IN INCHES**

**Note I**: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these areas.
Average Characteristics

$E_t = 6.3$ VOLTS

PLATE (I_p) OR GRID (I_c) MILLIAMPERES

GRID VOLTS, $E_g=0$.

PLATE VOLTS

92CM-11722

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 4
7-65
Traveling-Wave Tube
Frequency Range 8 to 12 GHz
Integral Periodic-Permanent-Magnet Type

ELECTRICAL
Heater, for Unipotential Cathode:
Voltage (ac or dc) ..................... 6.3 ± 5% V
Current at 6.3 volts ................... 0.7 A
Starting Current ...................... Must never exceed 4 amperes, even momentarily
Minimum Cathode Heating Time ........ 3 minutes
Frequency Range ...................... 8 to 12 GHz
Cold Insertion Loss ................... 60 dB
Input VSWR .......................... 2.5:1 max.
Output VSWR .......................... 2.0:1 max.
Gain, Small Signal (at 0.1 W output) 8.0 to 12 GHz ........ 34 min. dB

MECHANICAL
Operating Position ..................... Any
Maximum Dimensions:
Overall Length ....................... 15 max. in
Height ................................ 3.25 max. in
Width ................................ 2.20 max. in
Shell Diameter ....................... 1.75 in
Connectors:
RF Input ................................ Type TNC Plug
RF Output ............................. Special Flange Coupling
Terminal Leads ........................ See Dimensional Outline
Weight (Approx.) ...................... 6.0 lb

RF POWER AMPLIFIER
Maximum Ratings, Absolute-Maximum Values
DC Collector Voltage .................. 3000 max. V
DC Helix Voltage ...................... 2950 max. V
DC Grid-No.2 Voltage .................. 2000 max. V
DC Collector Current .................. 15 max. mA
DC Helix Current ...................... 2.5 max. mA
DC Grid-No.2 Current .................. 0.1 max. mA
RF Power Input ....................... 1 max. mW

RCA Electronic Components
DATA 1
12-68
Typical Operation at 10 GHz

DC Collector Voltage: 3000 V
DC Helix Voltage: 2800 V
DC Grid-No.2 Voltage: 1800 V
DC Collector Current: 12 mA
DC Helix Current: 0.5 mA
DC Grid-No.2 Current: 0 mA

Input VSWR: 2.0:1
Output VSWR: 1.5:1
RF Power Input: 1 to 10 mW
Saturated Power Output: 1.5 W

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Note</th>
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<td>DC Helix Current</td>
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<tr>
<td>DC Grid-No.2 Current</td>
<td>0</td>
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<td>-</td>
</tr>
</tbody>
</table>

Note 1: With heater voltage of 6.3 volts.
Note 2: Normally the tube is operated with the helix voltage equal to the collector voltage.
Note 3: Specific operating value is supplied with each tube.

OPERATING CONSIDERATIONS

The magnetic field required to focus the electron beam in the 4041 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize, and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 4041 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 4:1. With VSWR’s in excess of
4:1, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Conduction cooling on the tube is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube.

The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the grid No.2 voltage decays faster than all other voltages (except the heater voltage).

Mounting. The 4041 may be mounted in any position by means of clamps around the specified areas shown on the Dimensional Outline.

Electrical connections are made to the 4041 by means of the six leads. These color-coded, flexible, insulated leads are identified on the Dimensional Outline. The rf input is made to a type TNC male plug on the tube, the rf output is by means of a flange coupling and a transition piece (see Dimensional Outline). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

Starting Procedure

Voltages should be applied to the 4041 in the following sequence: Apply the rated heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on
the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

**Turn-Off Procedure**

To turn off the tube, remove the electrode voltages in the following sequence: First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.

**FLEXIBLE LEAD COLOR CODE (See Dimensional Outline)**

- Yellow: Heater-Cathode
- Brown: Heater
- Green: Grid No.1
- Black: Collector (Ground)
- Orange: Helix
- Blue: Grid No.2 (Anode)
DIMENSIONAL OUTLINE (Front View)

- 2 Holes: .1285 ± .0005 Dia.
- 4 Holes: .166 ± .005 Dia. Thru
- .98 x .80 Slot
- .644 ± .015
- 2.09 ± .06
- 15 Max.
- 4.888 ± .125
- 1.0 ± .03
- 2.12 ± .01

DIMENSIONS IN INCHES

Electronic Components

DATA 3
12-68
DIMENSIONAL OUTLINE (Side View)

DIMENSIONS IN INCHES

Note: RF output flange requires use of a transition piece (Waveline Type 60083, or equivalent) if matching to standard waveguide flange.
Traveling-Wave Tube

**FREQUENCY RANGE**
1–2 Gc (L-Band)

**HELI-X-TRANSMISSION-LINE TYPE**

**INTEGRAL PERIODIC-PERMANENT-MAGNET TYPE**

**Electrical:**
Heater, for Unipotential Cathode:
- Voltage (AC or DC) .................................................. 6.3 ± 5% volts
- Current at heater volts = 6.3 ........................................ 1.75 amp
- Starting Current ...................................................... Must never exceed 4 amperes, even momentarily

Minimum Cathode Heating Time ........................................ 3 minutes
Frequency Range .......................................................... 1 to 2 Gc
Cold Insertion Loss ...................................................... 60 db
Thermostatic Switch:
- Current rating:
  - At 125 volts ac .................................................. 6 amp
  - At 240 volts ac .................................................. 4 amp
- Input VSWR ............................................................... 1.8:1 max.
- Output VSWR ............................................................. 1.8:1 max.

**Mechanical:**
Operating Position ....................................................... Any
Maximum Overall Length .............................................. 20.50”
Maximum Height ......................................................... 3.875”
Maximum Width .......................................................... 3.125”
Maximum Shell Diameter ............................................. 1.625”
Weight (Approx.) ......................................................... 6.5 pounds
Connectors:
- RF Input ................................................................. Type N Plug (UG-18 B/U)
- RF Output ................................................................. Type N Plug (UG-18 B/U)
- Terminal Leads .......................................................... See accompanying Dimensional Outline

**Thermal:**
Collector Temperature .................................................. 225 max. °C
Air Flow into Radiator .................................................. 25 min. cfm

**RF POWER AMPLIFIER**

**Maximum Ratings, Absolute-Maximum Values:**
- DC Collector Voltage .............................................. 3000 volts
- DC Helix Voltage ..................................................... 2500 volts
- DC Grid-No.2 Voltage ............................................... 1700 volts
- DC Collector Current ................................................ 80 ma
- DC Helix Current ..................................................... 3 ma
- DC Grid-No.2 Current ............................................... 1 ma
- RF Power Input ....................................................... 5 watts

*The thermostatic switch will open when collector temperature exceeds 225°C.*

**RADIO CORPORATION OF AMERICA**
Electronic Components and Devices
Harrison, N. J.

DATA 1
5–65
Typical Operation at 1.4Gc:

DC Collector Voltage: 2200 volts
DC Helix Voltage: 2200 volts
DC Grid-No.2 Voltage: 1500 volts
DC Collector Current: 70 ma
DC Helix Current: 0.25 ma
DC Grid-No.2 Current: 0.25 ma
Gain at 10 Watts: 28 db
Saturated Power Output: 13 watts

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
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<td>2</td>
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<tr>
<td>DC Collector Voltage</td>
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</tr>
<tr>
<td>DC Helix Voltage</td>
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<td>2500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>3</td>
<td>1150</td>
<td>1600</td>
</tr>
<tr>
<td>DC Collector Current</td>
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<td>60</td>
<td>75</td>
</tr>
<tr>
<td>DC Helix Current</td>
<td>3</td>
<td>1.1</td>
<td>1</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

Note 1: With heater volts = 6.3.
Note 2: Normally the tube is operated with the helix voltage equal to the collector voltage.
Note 3: Specific operating value is supplied with each tube.

OPERATING CONSIDERATIONS

The magnetic field required to focus the electron beam in the 4053 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 4053 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 2:1. With VSWR's in excess of this value, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Forced-air cooling of the collector is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube. It is recommended that the forced-air cooling be applied when the heater power is applied.

A thermostatic switch is mounted on the collector of the 4053 which opens when the collector temperature exceeds a safe limit. It is recommended that the thermostatic switch be used in an interlock circuit in the power supply for the collector, helix, and grid-No.2 voltages. The thermostatic switch will carry 6 amperes at 125 volts ac or 3 amperes at 240 volts ac.
The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the helix voltage decays faster than the collector voltage.

As the grid-No.2 voltage increases from zero to the operating value, the helix current may reach as high as 10 ma in the vicinity of 200 to 600 volts on grid No.2, then will fall below 2 ma at the proper operating grid-No.2 voltage. The helix supply should have adequate regulation to handle this transient during the turn on procedure. In order to protect the tube, the helix supply should also have an interlock to open the circuit if the helix current exceeds 3 ma longer than a few milliseconds.

Mounting. The 4053 may be mounted in any position by means of bolts through either set of holes in the two mounting blocks.

Electrical connections are made to the 4053 by means of the seven leads. These color-coded, flexible, insulated leads are identified on the Dimensional Outline. RF input and output connections are made to type N plugs (UG-18 B/U) on the tube (see Dimensional Outline). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

STARTING PROCEDURE

Voltages should be applied to the 4053 in the following sequence: Apply the rated heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

TURN-OFF PROCEDURE

To turn off the tube, remove the electrode voltages in the following sequence. First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.
DIMENSIONAL OUTLINE

3 FLEXIBLE LEADS
18 INCHES LONG
SEE COLOR CODE

2 TYPE N CONNECTORS
(UG-188/U)

4 FLEXIBLE LEADS
18 INCHES LONG
SEE COLOR CODE

DIMENSIONS IN INCHES

COLOR CODE OF LEADS

HEATER . . . . . . . . . . . . . . . . . Brown
HEATER, CATHODE, GRID No.1 . . Yellow
HELIX . . . . . . . . . . . . . . . . . Orange
GRID No.2 . . . . . . . . . . . . . Blue
COLLECTOR, SHELL . . . . . . . Black
THERMOSTATIC SWITCH (2) . . . . . White

DATA 2
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
# Traveling-Wave Tube

**Frequency Range**: 1.7 to 2.7 GHz

**Integral Periodic-Permanent-Magnet Type**

## ELECTRICAL

**Heater, for Unipotential Cathode:**
- Voltage (ac or dc) ........... $6.3 \pm 5\%$ V
- Current at 6.3 volts .......... 1.75 A
- Starting Current ............ Must never exceed 4 amperes, even momentarily

**Minimum Cathode Heating Time** ........... 3 minutes

**Frequency Range** .......... 1.7 to 2.7 GHz

**Cold Insertion Loss** .......... 60 dB

**Input VSWR** .......... 1.8:1 max.

**Output VSWR** .......... 1.8:1 max.

**Noise Figure** .......... 30 max. dB

**Gain (at 20 W output):**
- 1.8 to 2.4 GHz ............ 30 min. dB
- 2.4 to 2.7 GHz ............ 29 min. dB

**Gain (at 16 W output):**
- 1.8 to 2.7 GHz ............ 30 min. dB

**Gain (at 17 W output):**
- 1.7 to 1.8 GHz ............ 29.5 min. dB

**Gain Compression (referenced to 5 W):**
- at 10 W output ............ 1 max. dB
- at 20 W output ............
  - 1.8 to 2.4 GHz ............ 3 max. dB
  - 2.4 to 2.7 GHz ............ 4 max. dB
- at 17 W output ............
  - 1.7 to 1.8 GHz ............ 4 max. dB

**Phase Sensitivity (with Beam-Voltage Variation):**
- 2 max. °/V

**Bandwidth Flatness (over a 15-MHz segment):**
- 0.02 max. dB/MHz

## MECHANICAL

**Operating Position**: Any

**Maximum Dimensions:**
- Overall Length .......... 19 in
- Height .................. 3.88 in
- Width .................. 3.12 in
- Shell Diameter .......... 3.62 in

**Connectors:**
- RF Input ............... Type N Plug (UG-18 B/U)
- RF Output ............... Type N Plug (UG-18 B/U)
- Terminal Leads .......... See Dimensional Outline

**Weight (Approx.)** .......... 6.5 lb
RF POWER AMPLIFIER

Absolute-Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Collector Voltage</td>
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<tr>
<td>DC Helix Voltage</td>
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Typical Operation at 2.0 GHz

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<td>Saturated Power Output</td>
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CHARACTERISTICS RANGE VALUES

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<tr>
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<tr>
<td>DC Grid-No.2 Voltage</td>
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<tr>
<td>DC Grid-No.2 Current</td>
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Note 1: With heater voltage of 6.3 volts.
Note 2: Normally the tube is operated with the helix voltage equal to the collector voltage.
Note 3: Specific operating value is supplied with each tube.

OPERATING CONSIDERATIONS

The magnetic field required to focus the electron beam in the 4054 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize, and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within
the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 4054 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 2:1. With VSWR's in excess of 2:1, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

 Forced-air cooling on the collector is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube. It is recommended that the forced-air cooling be applied when the heater power is applied.

The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the helix voltage decays faster than the collector voltage.

As the grid-No.2 voltage increases from zero to the operating value, the helix current may reach as high as 10 milliamperes with grid-No.2 voltage in the range of 200 to 600 volts, then will fall below 2 milliamperes at the proper operating grid-No.2 voltage. The helix supply should have adequate regulation to handle this transient during the turn-on procedure. To protect the tube, it is recommended that an interlock be incorporated in the helix supply to open the circuit if the helix current exceeds 3 milliamperes longer than a few milliseconds.

Mounting. The 4054 may be mounted in any position by means of bolts through either set of holes in the two mounting blocks.

Electrical connections are made to the 4054 by means of the five leads. These color-coded, flexible, insulated leads are identified on the Dimensional...
Outline. The rf input and output connections are made to type N plugs (UG-18 B/U) on the tube (see Dimensional Outline). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

Starting Procedure

Voltages should be applied to the 4054 in the following sequence: Apply the rated heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

Turn-Off Procedure

To turn off the tube, remove the electrode voltages in the following sequence: First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.

FLEXIBLE LEAD COLOR CODE (See Dimensional Outline)

Brown: Heater
Yellow: Heater-Cathode
Orange: Helix
Blue: Grid No.2 (Anode)
Block: Collector (Ground)
DIMENSIONAL OUTLINE (Dimensions In Inches)

- 3.600 ± .015
- 10.860 ± .125
- 1.800 ± .015
- .90 ± .015
- 1.500 ± .015
- .750 ± .015
- .5

TYPE N (UG-18 B/U)
2 CONNECTORS

4 HOLES
.226 ± .015
DIA. THRU

5 FLEXIBLE LEADS
18 INCHES LONG
(SEE COLOR CODE)

RCA Electronic Components

DATA 3
12-68
High-Mu Triode

CERAMIC-METAL PENCIL TUBE
OPERATING FREQUENCIES UP TO 4 GHz AND ABOVE

For Plate-Pulsed Operation as a Power Amplifier, Oscillator, and Frequency Multiplier in Compact Mobile and Aircraft Equipment at Altitudes up to 50,000 Feet without Pressurization

ELECTRICAL

Heater, for Unipotential Cathode
Voltage (AC or DC) ........................................... 6.3 ± 10% V
Current at 6.3 volts ........................................... 0.295 A

Cathode Warmup Time (Average) to reach 80%
of operating power output as rf oscillator
or amplifier ................................................... 5 s

Amplification Factor ........................................... 70

Transconductance, for dc plate mA = 35, dc plate volts = 150, and cathode resistor
= 11 Ω .......................................................... 35000 μmho

Direct Inter-electrode Capacitances
Grid to plate ..................................................... 2.0 pF
Grid to cathode ................................................ 5.5 pF
Plate to cathode ................................................ 0.06 max pF

MECHANICAL

Operating Position .............................................. Any
Weight ............................................................. 0.4 oz
Dimensions and Terminal Connections ................ See accompanying Dimensional Outline

Sockets
Heater-Terminals Connector ................................... Grayhill\textsuperscript{a} No.22-5, or equivalent

Socket for operation up to about
550 MHz (Including heater-terminals connector) .... Jettron\textsuperscript{b} No.CD7010, or equivalent

TERMINAL DIAGRAM (Bottom View)

H - Heater
K - Cathode

G - Grid
P - Plate

\textsuperscript{a} Indicates a change.
## PLATE-PULSED SERVICE—Class C

### Maximum Ratings, Absolute-Maximum Values Up to 4 GHz

*For a maximum duty factor of 0.01*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Ratings</th>
<th>Absolute-Maximum Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Plate Voltage</td>
<td>3500 max</td>
<td>2000 max</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.0 max</td>
<td>3.0 max</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>40 max</td>
<td>40 max</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>15 max</td>
<td>15 max</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>10 max</td>
<td>10 max</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td>60 max</td>
<td>60 max</td>
</tr>
<tr>
<td>Typical Operation as Plate-Pulsed Oscillator at 3.3 GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Plate Voltage</td>
<td>1750 V</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.0 mA</td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>1.4 mA</td>
<td></td>
</tr>
<tr>
<td>Usefull Resistor</td>
<td>2000 Ω</td>
<td></td>
</tr>
<tr>
<td>Usefull Power Output at Peak of Pulse (Approx.)</td>
<td>1300 W</td>
<td></td>
</tr>
<tr>
<td>Typical Operation as a Power Amplifier in Frequency Range of 1 to 1.2 GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Plate Voltage</td>
<td>1300 V</td>
<td></td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1.5 A</td>
<td></td>
</tr>
<tr>
<td>Usefull Power Output at Peak of Pulse (Approx.)</td>
<td>1000 W</td>
<td></td>
</tr>
</tbody>
</table>

- a Grayhill, Inc., 561 Hillgrove Ave., La Grange, Ill.
- b Jettron Products, Inc., 56 Route 10, Hanover, N. J.
- c When used in a heat sink that will limit the plate-seal temperature to 2250°C.
Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular Surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular Surface "C" is on the side of the grid flange toward the plate cylinder.

Note 1: With annular surface "B" resting on reference plane "A", the axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch.

Note 4: Pin diameter is slightly greater when pretinned.

Indicates a change.
Plate-Current Cutoff Characteristic

$E_f = 6.3 \text{ V}$

$I_C$ for cutoff condition equals 50 μA

Average Plate and Grid Characteristics

$E_f = 6.3 \text{ V}$

Plate Current

Grid Current
Medium-Mu Triode

GLASS-METAL PENCIL TYPE
For Use at Frequencies Up to 4000 Mc/s in Pulse Service and 2000 Mc/s in CW Service

ELECTRICAL

Heater, for Unipotential Cathode
Voltage (AC or DC):
Under transmitting conditions, 6.0 ± 10% V
Under standby conditions, 6.3 max V
Current at 6.0 V, 0.300 A
Amplification Factor, 40
Transconductance, 7300 μmhos
For dc plate current of 22 mA and dc plate voltage of 200 V
Direct Interelectrode Capacitances (Approx.):
Grid to plate, 1.8 pF
Grid to cathode, 3.2 pF
Plate to cathode, 0.07 max pF

MECHANICAL

Operating Position, Any
Dimensions and Terminal Connections, See Dimensional Outline
Plate Seal Temperature, 175 max °C
Weight (Approx.), 0.4 oz

Sockets
Heater terminals connector, Grayhill No. 22-8

TERMINAL CONNECTIONS (See Dimensional Outline)

H—Heater
K—Cathode (Cylinder adjacent to heater pins)
G—Grid (Flange between glass sections)
P—Plate (Cylinder adjacent to pinch-off)

PLATE-PULSED OSCILLATOR CLASS C
Maximum CCS Ratings, Absolute-Maximum Values
For a maximum "ON" time of 5 microseconds in any 500-microsecond interval.
For altitudes up to 30,000 feet

Peak Positive-Pulse Plate-Supply Voltage, 2000 V
Peak Grid-Bias Voltage
Negative pulse, 150 V
Positive pulse, 25 V
Peak Plate Current, 8 A
From pulse supply
Peak Rectified Grid Current, 1.5 A
DC Plate Current, 0.03 A

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Up to 4000 Mc/s

<table>
<thead>
<tr>
<th>DC Grid Current</th>
<th>0.013 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Dissipation</td>
<td>7 W</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>5 µs</td>
</tr>
</tbody>
</table>

**Typical Operation with Rectangular Wave Shape in Cathode-Drive Circuit at 3300 Mc/s**

With duty factor of 0.01 and pulse duration of 1 microsecond

<table>
<thead>
<tr>
<th>Peak Positive-Pulse Plate-Supply Voltage</th>
<th>1750 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Negative-Pulse Grid-bias voltage</td>
<td>110 V</td>
</tr>
<tr>
<td>From grid resistor of.</td>
<td>100 A</td>
</tr>
<tr>
<td>Peak Plate Current From pulse supply</td>
<td>3 A</td>
</tr>
<tr>
<td>Peak Rectified Grid Current.</td>
<td>1.1 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.03 A</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>0.011 A</td>
</tr>
<tr>
<td>Useful Power Output. At peak of pulse (approx.)</td>
<td>800 W</td>
</tr>
</tbody>
</table>

**RF POWER AMPLIFIER AND OSCILLATOR—CLASS C TELEGRAPHY**

*Key-down conditions per tube without amplitude modulation*

**Absolute-Maximum Ratings**

*For altitudes up to 60,000 feet*

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>330</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-100</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>25</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>55</td>
</tr>
<tr>
<td>Plate Input</td>
<td>13.2</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>8</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage: Heater negative with respect to cathode.</td>
<td>50</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>50</td>
</tr>
</tbody>
</table>

**Typical Operation as Oscillator in Cathode-Drive Circuit at 500 Mc/s**

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>325</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>25</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>35</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>11</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>5n</td>
</tr>
</tbody>
</table>

**Typical Operation as Oscillator in Cathode-Drive Circuit at 1700 Mc/s**

<table>
<thead>
<tr>
<th>CCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
</tr>
<tr>
<td>DC Plate Current</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
</tr>
</tbody>
</table>
Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc/s

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CC</th>
<th>ICAS</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td></td>
<td></td>
<td>342</td>
<td>395</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td></td>
<td></td>
<td>42</td>
<td>45</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td></td>
<td></td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td></td>
<td></td>
<td>2.4</td>
<td>3</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
<td></td>
<td>7.5</td>
<td>10</td>
</tr>
</tbody>
</table>

Maximum Circuit Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Circuit Resistance</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

FREQUENCY MULTIPLIER

Absolute-Maximum Ratings

For altitudes up to 60,000 feet

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CC</th>
<th>ICAS</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td></td>
<td></td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td>-125</td>
<td>-140</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td>33</td>
<td>45</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td></td>
<td></td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td></td>
<td></td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Plate Input</td>
<td></td>
<td></td>
<td>9.9</td>
<td>15.9</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td></td>
<td></td>
<td>6</td>
<td>9.5</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Heater negative with respect to</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>cathode.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with respect to</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>cathode.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Typical Operation as Tripler to 510 Mc/s in Cathode-Drive Circuit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CC</th>
<th>ICAS</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td></td>
<td></td>
<td>410</td>
<td>472</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td></td>
<td></td>
<td>110</td>
<td>122</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td>26</td>
<td>36.5</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td></td>
<td></td>
<td>4.1</td>
<td>5.8</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td></td>
<td></td>
<td>2.75</td>
<td>4.5</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
<td></td>
<td>2.1</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Maximum Circuit Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Circuit Resistance</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

---

b. In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied.
c. Continuous Commercial Service.
d. "ON" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.
e. The magnitude of any spike on the plate voltage pulse should not exceed a value of 2000 volts with respect to cathode and its duration should not exceed 0.01 microsecond measured at the peak-pulse-value level.
f. In applications where the plate dissipation exceeds 3 watts, it is important that a large area of contact be provided between the plate cylinder and the connector in order to provide adequate heat conduction.
9 Duty factor is the product of pulse duration and repetition rate. For
variable pulse durations and pulse repetition rates, the duty factor is
defined as the ratio of time "ON" to total elapsed time in any 500-micro-
second interval.

h The power output at peak of pulse is obtained from the average power
output using the duty factor of the peak pulse. This procedure is
necessary since the power output pulse duty factor may be less than the
applied voltage pulse duty factor because of a delay in the start of rf
power output.

j Modulation, essentially negative, may be used if the positive peak of
the audio-frequency envelope does not exceed 115 percent of the carrier
conditions.

k Intermittent Commercial and Amateur Service.

m From a grid resistor, or from a suitable combination of grid resistor
and fixed supply or grid resistor and cathode resistor.

n This value of useful power is measured at load of output circuit having
an efficiency of about 75 percent.

DIMENSIONAL OUTLINE

Note 1: Max. eccentricity of center line (Axis) of plate terminal
or grid-terminal flange with respect to the center line
(Axis) of the cathode terminal is 0.010 inch.

Note 2: Tilt of grid-terminal flange with respect to rotational
axis of cathode terminal is determined by chucking the cathode
terminal, rotating the tube, and gauging the total travel distance
of the grid-terminal flange parallel to the axis of a point
approximately 0.020 inch inward from its edge for one complete
rotation. The total travel distance will not exceed 0.020 inch.
High-Mu Triode

CERAMIC-METAL PENCIL TUBE

OPERATING FREQUENCIES UP TO 4 GHz AND ABOVE

For Grid-Pulsed Operation as a Power Amplifier or Oscillator in Compact Mobile and Aircraft Equipment at Altitudes up to 50,000 Feet without Pressurization

ELECTRICAL

Heater, for Unipotential Cathode  
Voltage (AC or DC) .................. 6.3 ± 10% V  
Current at 6.3 volts ................ 0.295 A

Cathode Warmup Time (Average) to reach 80% of operating plate current  
For conditions: dc plate supply volts = 0, cathode resistor = 0 Ω, load resistor = 10 Ω, heater volts = 6.3  
10 s

Amplification Factor ................ 100

Transconductance, for dc plate mA = 14, dc plate volts = 150, and cathode resistor = 11 Ω ................ 16,000 μS

Direct Interelectrode Capacitances  
Grid to plate .................. 1.75 pF  
Grid to cathode and heater ................ 3.9 pF  
Plate to cathode and heater ................ 0.08 max pF

MECHANICAL

Operating Position .................. Any

Weight (Approx.) .................. 0.4 ounce

Dimensions and Terminal Connections .................. See accompanying Dimensional Outline

Sockets  
Heater-Terminals Connector ................ Grayhill\textsuperscript{a} No.22-5, or equivalent

Socket for operation up to about 550 MHz (including heater-terminals connector) ................ Jettron\textsuperscript{b} No.CD7010, or equivalent

TERMINAL DIAGRAM (Bottom View)

\textbf{RADIO CORPORATION OF AMERICA}  
Electronic Components and Devices  
Harrison, N. J.

\textbf{DATA I}  
7-67
GRID-PULSED SERVICE - Class C
Maximum Ratings, Absolute-Maximum Values Up to 4 GHz
For a maximum long-term duty factor of 0.01°C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2000 max V</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
</tr>
<tr>
<td>Negative-bias value.</td>
<td>200 max V</td>
</tr>
<tr>
<td>Positive value during gating pulse</td>
<td>25 max V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>3.0 max A</td>
</tr>
<tr>
<td>Peak Grid Current</td>
<td>1.5 max A</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>10 max W</td>
</tr>
<tr>
<td>Grid Dissipation</td>
<td>0.5 max W</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>60 max V</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>60 max V</td>
</tr>
</tbody>
</table>

Typical Operation with Rectangular Waveshape in Grid-Drive Oscillator Circuit at 1090 MHz
With duty factor of 0.01 and pulse duration of 0.5 microsecond

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1400 V</td>
</tr>
<tr>
<td>Grid-Bias Voltage</td>
<td>-80 V</td>
</tr>
<tr>
<td>Peak Positive Grid Voltage*</td>
<td>20 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1 A</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse</td>
<td>500 W</td>
</tr>
</tbody>
</table>

Typical Operation with Rectangular Waveshape in Grid-Drive Amplifier Circuit at 1090 MHz
With duty factor of 0.005 and pulse duration of 0.5 microsecond

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>Grid-Bias Voltage</td>
<td>-30 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1.5 A</td>
</tr>
<tr>
<td>Peak Driving Power</td>
<td>150 W</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse</td>
<td>600 W</td>
</tr>
</tbody>
</table>

Typical Operation with Rectangular Waveshape in Cathode-Drive Amplifier Circuit at 1090 MHz
With duty factor of 0.01 and pulse duration of 0.5 microsecond

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>Cathode-Bias Voltage</td>
<td>25 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1.2 A</td>
</tr>
<tr>
<td>Peak Driving Power</td>
<td>180 W</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse</td>
<td>600 W</td>
</tr>
</tbody>
</table>

a Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.
b Jetrtron Products, Inc., 56 Route 10, Hanover, N.J.
c This value is for continuous pulsing. The duty factor can be 0.25 for any interval up to 100 microseconds in length as long as the long-term duty factor does not exceed 0.01.
d Plate-seal temperature must be limited to 225°C.
e Amplitude of grid-drive gating pulse is adjusted to produce this value.
Reference Plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts.

Annular surface "B" is on the side of the grid flange toward the cathode cylinder.

Annular surface "C" is on the side of the grid flange toward the plate cylinder.

Note 1: With annular surface "B" resting on reference plane "A", the axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

Note 2: The axes of the plate cylinder and cathode cylinder will coincide within 0.010 inch.

Note 3: The axes of the cathode cylinder and grid flange will coincide within 0.005 inch.

Note 4: Pin diameter is slightly greater when pretinned.
Average Constant-Current Characteristics of Type 4062A in Grid-Pulsed Service

\[ \text{Grid Voltage} = 0, 0.5, 1, 1.5, 2 \text{ Volts} \]

\[ \text{Plate Voltage} = 0, 200, 400, 600, 800, 1000 \text{ Volts} \]

\[ \text{Plate Current} = 0, 100, 200, 300, 400, 500, 600 \text{ Amps} \]

\[ \text{Grid Current} = 0, 0.5, 1, 1.5, 2 \text{ Amps} \]
Plate-Current Cutoff Characteristic

\[ E_f = 6.3 \text{ V} \]
\[ I_b \text{ FOR CUTOFF CONDITION EQUALS 50 } \mu \text{amps} \]

-60
-50
-40
-30
-20
-10
0
1000 2000 3000 4000
PLATE VOLTAGE — VOLTS
GRID VOLTAGE — VOLTS

DATE 3 7-67
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Pencil Tube Oscillator
L-Band Cavity Oscillator

**ELECTRICAL**

Heater, for Unipotential Cathode:
- Voltage (AC or DC) .................. 6.3 ± 10% V
- Current at 6.3 volts ................ 0.33 max. A
- Frequency .......................... 1090 MHz
- Tuning Range ...................... ±15 MHz
- RF Coaxial Output Terminal ........ Mates with female snap-on-type connector Sealectro No.51-007-0000, or equivalent

**MECHANICAL**

- Operating Position .................. Any
- Dimensions and Terminal Connections .... See Dimensional Outline
- Weight (Approx.) ................... 4 oz

**ENVIRONMENTAL**

The units will remain stable within ± 3 MHz in frequency and - 2 dB in peak power output (from nominal conditions) under any combination of the following conditions:
- Operating Temperature .............. -46 to +71 °C
- Altitude ........................... Up to 35,000 ft
- Output VSWR (All phase angles) ...... 1.1:1
- Plate and Heater Voltage Variation ..... ±10 %
- Duty Factor ........................ Up to 0.01

**GRID-PULSED OSCILLATOR — CLASS C**

**MAXIMUM RATINGS, Absolute-Maximum Values**

For a maximum duty factor of 0.01:
- DC Plate Voltage .................. 1540 max. V
- DC Grid Voltage:
  - Negative-bias value .............. 100 max. V
  - Positive value during gating pulse 0 max. V
  - Peak Plate Current .............. 1.2 max. A
  - Peak Grid Current ................ 0.7 max. A
Plate Dissipation: 15 max. W
Grid Dissipation: 1.0 max. W
Peak Heater-Cathode Voltage:
  Heater negative with respect to cathode: 60 max. V
  Heater positive with respect to cathode: 60 max. V

Typical Operation with Rectangular Waveshape in Grid-Pulsed Circuit at 1090 MHz
With duty factor of 0.001 and pulse duration of 0.45 microseconds:
DC Plate Voltage: 1400 V
Grid-Bias Voltage: -80 V
DC Plate Current: 1 mA
Useful Power Output at Peak of Pulse: 500 W

a) Duty factor is defined as the product of the pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of the "ON" time to total elapsed time in any 500-microsecond interval. "ON" time is defined as the sum of the durations all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. Peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

b) When operated for 10 minutes per hour. For continuous pulsing, the maximum duty factor is 0.005.
RECOMMENDED GRID-PULSE AMPLIFIER (MODULATOR)

INPUT PULSE

ADJ. TO PRODUCE REQUIRED OUTPUT

470 pF

270Ω 1/4 W

50Ω 1/4 W
1:1 PULSE transformer

27Ω 1/4 W

150Ω 1/4 W

2N2405

75Ω 1/4 W

470Ω 1/4 W

5pF

OUTPUT PULSE

= 60V
Note 1: Mates with female snap-on-type connector Seelectro No.51-007-0000, or equivalent

Dimensions in inches unless otherwise noted

The millimeter dimensions are derived from the original inch dimensions (1 inch = 25.4 mm exactly).
Pencil-Tube Oscillator-Amplifier

600W Peak Power Output at 1090 MHz

**ELECTRICAL**

Heater, for Unipotential Cathode:

- Voltage (AC or DC) .............. 6.3 ± 5% V
- Current at 6.3 volts (Total) ........ 0.66 max. A
- Frequency ...................... 1090 MHz
- Tuning Range ................. ±15 MHz

RF Coaxial Output Terminal .... Mates with female screw-type connector Selectro No.50-007-0000, Micon No.1002, or equivalent

Characteristics Impedance (Approx.) ............ 50 Ω

- Change in Peak Power Output During Modulation^b ........ 0.5 max. dB
- Pulse Rise Time (10% to 90%)^b ........... 55-90 ns
- Pulse Decay Time (90% to 10%) ............. 60-180 ns
- RF Delay Time (measured at 50% of pulse amplitude) ........ 250 max. ns
- RF Jitter .................................. 10 max. ns

**MECHANICAL**

Operating Position .................. Any
Dimensions and Terminal Connections .......... See Dimensional Outline
Total Weight ................................. 9 max. oz

**ENVIRONMENTAL**

The units will remain stable within ± 3 MHz in frequency and ± 3 dB in peak power output (from nominal conditions) under any combination of the following conditions:

Vibration:^c
- 20 to 33 Hz ...................... 2 G
- 33 to 105 Hz .................... 0.036 in DA
- 105 to 500 Hz
- Parallel ...................... 20 G
- Perpendicular .................. 15 G

Shock, 11 ms:^d ...................... 20 G

Case Temperature .................. -64 to +125 °C
Altitude ................................. Up to 30,000 ft
Output VSWR (All phase angles) ............... 1.5:1
Plate and Heater Voltage Variation .......... ±5 %
Duty Factor (Long term) ...................... Up to 0.01

GRID-PULSED OSCILLATOR – CLASS C
MAXIMUM RATINGS, Absolute-Maximum Values:

For a maximum long-term duty factor of 0.01
DC Plate Voltage (Each Unit) ............... 1050 max. V
Peak Oscillator Grid Current ............... 0.5 max. A
Peak Amplifier Cathode Current .......... 2.0 max. A
Peak Plate Current:
  Oscillator ......................... 0.7 max. A
  Amplifier ......................... 1.5 max. A
Plate Dissipation (Total) ............... 18 max. W
Peak Heater-Cathode Voltage:
  Heater negative with respect to cathode 60 max. V
  Heater positive with respect to cathode 60 max. V

TYPICAL OPERATION WITH RECTANGULAR WAVE SHAPE IN GRID-DRIVE CIRCUIT AT 1090 MHz

With duty factor of 0.01 and pulse duration of 0.45 microsecond

DC Plate Voltage (Each Unit) ............... 1000 V
Oscillator Grid Bias ...................... -80 V
Amplifier Cathode Bias .................. +25 V
DC Plate Current (Total) .............. 20 mA
Useful Power Output at Peak of Pulse ...... 600 W

a The change in peak power output between the first video pulse and any other video pulse in a pulse train consisting of 56 pulses. The individual pulse width is 0.45 microseconds and the pulse to pulse spacing is 1.45 microseconds.
b The pulse rise time and decay time are measured on an oscilloscope having a bandwidth of 24 MHz and a detector having a bandwidth of 12.4 GHz. If the bandwidth of either the oscilloscope or the detector is less than 15 MHz, the measurements must be corrected to account for changes introduced by the instrumentation.
c Tested per methods described in MIL-STD-202C, Test Method 204A, Test Condition A.
d Tested per methods described in MIL-STD-202C, Test Method 202B.
Duty factor is defined as the product of the pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of the "ON" time to total elapsed time in any 2500-microsecond interval. "ON" time is defined as the sum of the durations of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. Peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

This value is for continuous pulsing. The duty factor can be 0.25 for any interval up to 100 microseconds in length as long as the long-term duty factor does not exceed 0.01.

NOTE: See Type 4072 for Recommended Grid-Pulse Amplifier (Modulator)

DIMENSIONAL OUTLINE (4070)
DIMENSIONAL OUTLINE (4071)

Note 1: Diameter of shell in clamping areas only.

Note 2: Mates with female screw-type connector Seelectro No.50-007-0000, Micon No.1002, or equivalent.

These units are supplied without the mounting brackets; they are also available with brackets upon request.

Dimensions in inches unless otherwise noted.
Pencil Tube Oscillator
L-Band Cavity Oscillator

ELECTRICAL
Heater, for Unipotential Cathode:
Voltage (AC or DC) ............. 6.3 ± 10% V
Current at 6.3 volts ............ 0.33 max. A
Frequency ..................... 1090 MHz
Tuning Range .................. ±15 MHz
RF Coaxial Output Terminal .... Mates with female snap-on-type connector Sealectro No.51-007-0000, or equivalent
Characteristic Impedance
(Approx.) ...................... 50 Ω
Maximum Output VSWR
(All phase angles) ............. 1.3:1

MECHANICAL
Operating Position .............. Any
Dimensions and Terminal Connections .... See Dimensional Outline
Weight (Approx.) ............... 4 oz

ENVIRONMENTAL
The units will remain stable within ± 3 MHz in frequency and −2 dB in peak power output (from nominal conditions) under any combination of the following conditions:

Operating Temperature ........ -46 to +71 °C
Altitude ...................... Up to 55,000 ft
Output VSWR (All phase angles) .... 1.1:1
Plate and Heater Voltage Variation .... ±10 %
Duty Factor .................. Up to 0.01

GRID-PULSED OSCILLATOR – CLASS C
MAXIMUM RATINGS, Absolute-Maximum Values
For a maximum duty factorb of 0.01c
DC Plate Voltage .............. 1540 max. V
DC Grid Voltage:
    Negative-bias value ........... 100 max. V
    Positive value during gating pulse .... 0 max. V

Electronic Components
Peak Plate Current: 1.2 max. A
Peak Grid Current: 0.7 max. A
Plate Dissipation: 15 max. W
Grid Dissipation: 1.0 max. W

Peak Heater-Cathode Voltage:
- Heater negative with respect to cathode: 60 max. V
- Heater positive with respect to cathode: 60 max. V

TYPICAL OPERATION WITH RECTANGULAR WAVE SHAPE IN GRID-DRIVE CIRCUIT AT 1090 MHz

With duty factor of 0.005 and pulse duration of 0.45 microsecond:

- DC Plate Voltage: 1400 V
- Grid-Bias Voltage: -80 V
- DC Plate Current: 1 mA
- Useful Power Output at Peak of Pulse: 500 W

Duty factor is defined as the product of the pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of the “ON” time to total elapsed time in any 2500-microsecond interval. “ON” time is defined as the sum of the durations of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. Peak value is defined as the maximum value as a smooth curve through the average of the fluctuations over the top portion of the pulse.

When operated for 10 minutes per hour. For continuous pulsing, the maximum duty factor is 0.005.
RECOMMENDED GRID-PULSE AMPLIFIER (Modulator)

INPUT PULSE

ADJ. TO PRODUCE REQUIRED OUTPUT

470 pF

270Ω 1/4 W

50Ω 1/4 W

1:1 PULSE TRANSFORMER

2N2405

27Ω 1/4 W

150Ω 1/4 W

470Ω 1/4 W

5μF

75Ω 1/4 W

-80V

OUTPUT PULSE

0V

≈ 80V
Note 1: Mates with female snap-on-type connector Sealexro No.51-007-0000, or equivalent

Dimensions in inches unless otherwise noted

Dimensions in mm unless otherwise noted
Beam Power Tube

FORCED-AIR COOLED
CERAMIC-METAL CONSTRUCTION  "ONE-PIECE" ELECTRODE DESIGN
COAXIAL-ELECTRODE STRUCTURE  INTEGRAL RADIATOR
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE
For Voltage-Regulator Applications

**GENERAL DATA**

**Electrical:**
Heater, for Matrix-Type Oxide-Coated Unipotential Cathode:
- Voltage (AC or DC): \( 5.5 \text{ typical volts} \)
- Current at heater volts = 5.5: \( 17.3 \text{ amp} \)
- Minimum heating time at heater volts = 5.5: \( 5 \text{ minutes} \)
- Mu-Factor, Grid No.2 to Grid No.1,
  - for plate volts = 2500, grid No.2 volts = 600, and plate ma. = 600: \( 17 \)

**Mechanical:**
- Operating Position: Any
- Overall Length: \( 3.25" \)
- Diameter: \( 3.725" \pm 0.035" \)
- Radiator: Integral part of tube
- Weight (Approx.): 2 lbs

**Terminal Connections (See Dimensional Outline):**

- \( G_1 \) - Grid No.1
- \( G_2 \) - Grid No.2
- \( H \) - Heater
- \( K \) - Cathode
- \( P \) - Plate

**Thermal:**
- Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater): \( 250 \text{ max. °C} \)

**Air Flow:**
- Through radiator—Adequate air flow to limit the plate-terminal temperature to 250° C should be delivered by a blower through the radiator before and during the application of heater, plate, grid No.2, and grid No.1 voltages.
- Typical values of air flow directed through the radiator versus plate dissipation are shown in accompanying Typical Cooling Requirements curve. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.
- To grid No.2, grid No.1, cathode, and heater terminals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these.
terminals so that its temperature does not exceed the specified maximum value of 2500°C. An air flow of 10 cfm is usually adequate.

VOLTAGE REGULATOR

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>3500 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>1 max. amp</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>50 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>1750 max. watts</td>
</tr>
</tbody>
</table>

CHARACTERISTICS RANGE VALUES

1. Heater Current ........................................... 16.3 18.2 amp
2. Direct Interelectrode Capacitances:
   - Grid No.1 to cathode ................................ 37 46 µuf
   - Grid No.1 to grid No.2 ................................ 46 62 µuf
   - Grid No.1 to plate ................................... 0.17 µuf
   - Grid No.2 to cathode ................................ 1.40 µuf
   - Grid No.2 to plate ................................... 14.6 17.8 µuf
   - Plate to cathode .................................... 0.017 µuf
3. Grid-No.1 Voltage (1) ................................... 5 30 volts
4. Grid-No.1 Voltage (2) ................................... 5 30 volts
5. Grid-No.2 Current (1) .................................. -15 0 ma
6. Grid-No.2 Current (2) .................................. -30 0 ma
7. Pulse Emission Voltage ................................ 650 volts

a Continuous Commercial Service,

b With external, flat, metal shield having diameter of 8" and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

c With external, flat, metal shield having diameter of 8" and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

d With dc plate voltage 3500 volts, dc grid-No.2 voltage of 400 volts, grid-No.1 circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.25 amperes.

e With dc plate voltage of 600 volts, dc grid-No.2 voltage of 400 volts, grid-No.1 circuit resistance of 30,000 ohms, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.5 amperes.

f With grid No.1, grid No.2, and plate tied together; and a pulse-voltage source connected between plate and cathode. The half-sinusoid (Approx.) pulse is 2 microseconds between the two points on the pulse at which the instantaneous value is 50% of the peak value, pulse-repetition frequency is 60 cps, and duty factor is 0.00012. The voltage-pulse amplitude is adjusted until a peak cathode current of 90 amperes is obtained. After 2 minutes at this value, the voltage-pulse amplitude will not exceed 650 volts peak.

SPECIAL TEST

5-to-400 cps Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 5.5 volts ac, dc plate supply
voltage of 450 volts, dc grid-No.2 supply voltage of 300 volts, and grid-No.1 supply voltage adjusted to give dc plate current of 10 ma. Plate load resistor = 2000 ohms, grid-No.2 resistor = 1000 ohms, and grid-No.1 resistor = 30 ohms. The tube is vibrated along each of three mutually perpendicular axes over a 6-minute sweep consisting of:

(a) 5 to 22 cps with a fixed double amplitude of 0.240 inch ±10%.
(b) 22 to 200 cps at a fixed acceleration of 10 g ± 10%.
(c) 200 to 400 cps at a fixed acceleration of 3 g ± 10%.

At the end of this test, the tubes are required to meet the limits of items 1, 3, 4, 5, 6, and 7 under Characteristics Range Values.

OPERATING CONSIDERATIONS

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.
NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010''-THICKNESS GAUGE 1/8'' WIDE WILL NOT ENTER MORE THAN 1/16'' BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.
**SKETCH G**

**REFERENCE**

*This surface is flat within .0005 peak to valley and is perpendicular to the axis of the cylindrical holes within .0025.*

The axes of the cylindrical holes H1 through H5 and the axis of post P are coincident within .001.

**DETAIL OF POST P**

92CM-1100

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**RADIO CORPORATION OF AMERICA**

Electron Tube Division

Harrison, N. J.

DATA 3

9-62
TYPICAL COOLING REQUIREMENTS

AIR FLOW THROUGH RADIATOR IN EITHER DIRECTION.
MAXIMUM PLATE-TERMIAL TEMPERATURE = 250°C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE DROP— INCHES OF WATER</td>
<td>0.35</td>
<td>0.6</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

MAXIMUM ALLOWABLE TEMPERATURE RISE WITH INCOMING—AIR TEMPERATURE OF 45°C

PLATE DISSIPATION — WATTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 5.5
GRID - No. 2 VOLTS = 400
GRID - No. 1 VOLTS = $E_C$
TYPICAL CHARACTERISTICS

HEATER VOLTS = 5.5
GRID-No. 2 VOLTS = 400
GRID-No. 1 VOLTS = E_C1
Beam Power Tube

QUICK-HEATING FILAMENT
90 WATTS CW INPUT (ICAS) UP TO 60 Mc
60 WATTS CW INPUT (ICAS) AT 175 Mc

For Use in Push-to-Talk Mobile and Emergency-Communications Equipment as an RF Power-Amplifier Tube

GENERAL DATA

Electrical:
Filament, Coated:
Voltage (AC or DC)................. 6.3 ± 10% volts
Current at 6.3 volts.............. 0.65 amp
Heating time.......................... 1 sec
Transconductance, for plate volts = 200,
grid-No.2 volts = 200, and plate
ma. = 100... 6000 µhos
Mu-Factor, Grid No.2 to Grid No.1 for
plate volts = 200, grid-No.2 volts
= 200, and plate ma. = 100...... 4
Direct Interelectrode Capacitances:
Grid No.1 to plate............ 0.24 max. µf
Grid No.1 to filament & grid No.3 &
internal shield, grid No.2, and
base sleeve.................. 11 µf
Plate to filament & grid No.3 &
internal shield, grid No.2, and
base sleeve.................. 8.5 µf

Mechanical:
Operating Position.............. Vertical, base down or up, or
Horizontal with pins 3 and 7 in vertical plane
Maximum Overall Length........ 3-13/16"
Seated Length .................. 3-1/8" ± 1/8"
Maximum Diameter.............. 1-21/32"
Bulb................................ T12
Cap.................................. Small (JEDEC No.C1-1)
Socket..................... Standard Octal 8-Contact
Base...................... Small Wafer Octal 8-Pin with "770" Sleeve
(JEDEC Group 1, No.B8-150)
Basing Designation for BOTTOM VIEW........... 7CL

Pin 1—Filament Tap,
Grid No.3,
Internal
Shield
Pin 2—Filament
Pin 3—Grid No.2
Pin 4—Same as Pin 1
Pin 5—Grid No.1
Pin 6—Same as Pin 1
Pin 7—Filament
Pin 8—Base Sleeve
Cap—Plate
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

RF POWER AMPLIFIER — Class C FM Telephony

**Maximum ICAS° Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>750 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>250 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-150 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>150 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>4 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>90 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>3 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>BULB TEMPERATURE (At hottest point on bulb surface)</td>
<td>220 max. °C</td>
</tr>
</tbody>
</table>

**Typical Operation:**

As amplifier at 175 Mc

- DC PLATE VOLTAGE: 400 volts
- DC GRID-No.2 VOLTAGE: 190 volts
- DC GRID-No.1 VOLTAGE: 18000 ohms
- DC PLATE CURRENT: 150 ma
- DC GRID-No.2 CURRENT: 11 ma
- DC GRID-No.1 CURRENT (Approx.): 2 ma
- Driving Power (Approx.): 4.5 watts
- Power Output (Approx.): 30 watts

**Maximum Circuit Values:**

- Grid-No.1-Circuit Resistance: 30000 max. ohms

---

**Characteristics Range Values for Equipment Design**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current at 6.3 volts ac.</td>
<td>0.59</td>
<td>0.71</td>
</tr>
</tbody>
</table>

---

*Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.*

*Intermittent Commercial and Amateur Service.*

*Obtained preferably from a separate source, or from the plate supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 4604 is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.*

*Obtained from fixed supply, by grid-No.1 resistor, or by combination methods.*

*When grid No.1 is driven positive and the 4604 is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a fixed supply.*
Direct Interelectrode Capacitances:

<table>
<thead>
<tr>
<th>Grid No.1 to plate</th>
<th>0.24 μf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to filament &amp; grid No.3 &amp; internal shield, grid No.2, and base sleeve</td>
<td>9.5 12.5 μf</td>
</tr>
<tr>
<td>Plate to filament &amp; grid No.3 &amp; internal shield, grid No.2, and base sleeve</td>
<td>7.3 9.5 μf</td>
</tr>
<tr>
<td>Plate Current</td>
<td>46 94 ma</td>
</tr>
<tr>
<td>Grid—No.2 Current</td>
<td>5.5 ma</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>47 watts</td>
</tr>
</tbody>
</table>

* With 6.3 volts ac on filament, dc plate voltage of 300 volts, dc grid—No.2 voltage of 200 volts, and dc grid—No.1 voltage of −29 volts.

† In a single-tube, self-excited-oscillator circuit, and with 6.3 volts ac on filament, dc plate voltage of 600 volts, dc grid—No.2 voltage of 200 volts, grid—No.1 resistor of 30,000 ± 10% ohms, dc plate current of 100 to 112 ma., dc grid—No.1 current of 2 to 2.5 ma., and frequency of 15 Mc.

OPERATING CONSIDERATIONS

The bulb becomes hot during operation. To insure adequate cooling, therefore, it is essential that free circulation of air be provided around the 4604.

The plate shows no color when the 4604 is operated at full ratings under ICAS conditions. Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.
RATING CHART
ICAS Class-C Telegraphy or Telephony Service

$E_p = 6.3 \text{ VOLTS AC}$

<table>
<thead>
<tr>
<th>FREQUENCY — Mc</th>
<th>MAXIMUM PLATE VOLTS</th>
<th>MAXIMUM PLATE INPUT — WATTS</th>
<th>INPUT VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>800</td>
<td>70</td>
<td>90</td>
</tr>
<tr>
<td>50</td>
<td>600</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>150</td>
<td>400</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>300</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

92CS-10617RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

\[ E_F = 6.3 \text{ VOLTS AC} \]
\[ \text{GRID-\#2 VOLTS} = 200 \]
\[ \text{GRID-\#1 VOLTS} = E_C \]

GRID-\#2 MILLIAMPERES

0 100 200 300 400 PLATE VOLTS

GRID-\#1 MILLIAMPERES

0 100 200 300 400 PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
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 \pm 0.31 in
Maximum Diameter: ... 11.25 in
Weight (Approx.): ... 38 lb
Terminal Connections: ... See Dimensional Outline

THERMAL

Ceramic-Insulator Temperature: ... 150 max °C
Metal-Surface Temperature: ... 100 max °C
Minimum Storage Temperature: ... -65 min °C

Water Flow

<table>
<thead>
<tr>
<th>Flow</th>
<th>Absolute</th>
<th></th>
<th>Max. Pressure for Typ. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typ. Flow</td>
<td>Min. Flow</td>
<td>g/•</td>
<td>psi</td>
</tr>
<tr>
<td>Through filament block</td>
<td>1.2</td>
<td>0.8</td>
<td>18</td>
</tr>
<tr>
<td>Through dc cathode block</td>
<td>1.2</td>
<td>0.8</td>
<td>18</td>
</tr>
<tr>
<td>Through grid-No.1 block</td>
<td>1.2</td>
<td>0.8</td>
<td>14</td>
</tr>
<tr>
<td>Through grid-No.2 block</td>
<td>1.2</td>
<td>0.8</td>
<td>18</td>
</tr>
</tbody>
</table>
**Water Flow (cont'd)**

**Max. Pressure**

<table>
<thead>
<tr>
<th>Absolute</th>
<th>Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typ. Flow</td>
<td>Min. Flow</td>
</tr>
<tr>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Flow g/m</td>
<td>Flow g/m</td>
</tr>
</tbody>
</table>

Through plate:
For plated dissipations up to 10 kW (Average)...
For plate dissipations of 10 kW to 30 kW (Average).

Resistivity of water at 25°C.........................1 min \( \text{MD-cm} \)
Water Temperature from any outlet...................70 max \( ^\circ \text{C} \)
External Gas Pressure......................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**

For frequencies from 195 to 600 MHz and a maximum "ON" time as specified in any 25000-microsecond interval

**Absolute-Maximum Ratings**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>&quot;ON&quot; time 15 ( \mu \text{s} )</th>
<th>2500 ( \mu \text{s} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>55</td>
<td>-</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Peak Positive-Pulse Grid-No.2 Voltage</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>DC or Peak Negative-Pulse Grid-No.1 Voltage</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>80</td>
<td>30</td>
</tr>
<tr>
<td>Peak Grid-No.2 Current</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Peak Rectified Grid-No.1 Current</td>
<td>0.32</td>
<td>2.5</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.06</td>
<td>0.2</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.06</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Absolute-Maximum Ratings (cont'd)

"ON" time 15 µs 2500 µs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Input (Average)</td>
<td>16</td>
</tr>
<tr>
<td>Plate Dissipation (Average)</td>
<td>8</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>50 KV</td>
</tr>
<tr>
<td>Peak Positive Pulse Grid-No.2 Voltage</td>
<td>2.1 KV</td>
</tr>
<tr>
<td>Peak Negative-Pulse Grid-No.1 Voltage</td>
<td>325 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>75 A</td>
</tr>
<tr>
<td>Peak Grid-No.2 Current</td>
<td>8 A</td>
</tr>
<tr>
<td>Peak Rectified Grid-No.1 Current</td>
<td>10 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.3 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.03 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.04 A</td>
</tr>
<tr>
<td>Peak Driver Power Output (Approx.)</td>
<td>20 kW</td>
</tr>
<tr>
<td>Useful Peak Power Output</td>
<td>2 kW</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>20</td>
</tr>
<tr>
<td>Peak Positive-Pulse Grid-No.2 Voltage</td>
<td>2 KV</td>
</tr>
<tr>
<td>Peak Negative-Pulse Grid-No.1 Voltage</td>
<td>350 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>27</td>
</tr>
<tr>
<td>Peak Grid-No.2 Current</td>
<td>1.6</td>
</tr>
<tr>
<td>Peak Rectified Grid-No.1 Current</td>
<td>1.2</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.62</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.096</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.072</td>
</tr>
<tr>
<td>Peak Driver Power Output (Approx.)</td>
<td>2.7 kW</td>
</tr>
<tr>
<td>Useful Peak Power Output</td>
<td>275</td>
</tr>
</tbody>
</table>

Maximum Circuit Value

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance</td>
<td>500 Ω</td>
</tr>
</tbody>
</table>

a 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 of cathode-terminal (cathode heater) occurs; this condition is not detrimental to tube operation or tube life.

b Measured directly across cooled element for the indicated typical flow.

c This pressure is related to the output-cavity pressurization as required to prevent corons or external arc-over.

d 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 corons or external arc-over at the ceramic insulator.

e 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.
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.

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

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.

See Electrical Considerations - Filament or Heater
See Cooling Considerations - Liquid Cooling
See Cooling Considerations - Forced-Air Cooling
See Classes of Service.

**CHARACTERISTICS RANGE VALUES**

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>460</td>
<td>530</td>
</tr>
<tr>
<td>Input Strap-Resonant Frequency</td>
<td>230</td>
<td>250 MHz</td>
</tr>
<tr>
<td>Output Strap-Resonant Frequency</td>
<td>240</td>
<td>260 MHz</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td>0.15 pF</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>0.15 pF</td>
<td></td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>12000 18000 pF</td>
<td></td>
</tr>
</tbody>
</table>

**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, ICE-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

- Plate Currents (A) vs. Plate Voltage (V)
- Grid Voltages (V) vs. Plate Voltage (V)

Legend:
- IC1 = Grid-No. 1 Amperes
- IC2 = Grid-No. 2 Amperes
- Grid-No. 1 Volt = 1800
- Grid-No. 2 Volt = 1800

Data 3

Radio Corporation of America
Harrison, N.J.
DIMENSIONS IN INCHES

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.
Super-Power Beam Power Tube

2-kW SHORT-PULSE POWER, 275-kW LONG-PULSE POWER
PULSE LENGTH TO 2500 MICROSECONDS

LOW FILAMENT POWER          WATER COOLED          FOR AIRBORNE USE

For RF-Pulse Power Amplifier Frequencies from 195 to 600 MHz

The 4616V1 is the same as the 4616 except the 4616V1 does not have a water separator.
Super-Power Triode

8 MEGAWATTS OF PEAK POWER OUTPUT AT 425 MHz

MATRIX-OXIDE-TYPE CATHODE LIQUID COOLED

DOUBLE-ENDED TERMINAL CONFIGURATION FOR SYMMETRICAL CIRCUITRY

For RF Power Amplifier in Pulse Service at Frequencies up to 450 MHz

ELECTRICAL

Filamentary Cathode, Multistrand, Matrix-Oxide-Type

Current (DC):
- Typical operating value: 1800 A
- Maximum value: 2000 A
- Maximum value for starting, even momentarily: 2000 A
- Minimum time to reach operating current: 30 s
- Minimum time at normal operating current before plate voltage is applied: 60 s

Voltage (DC):
- Typical value required to obtain 1800 amperes: 1.5 V

Direct Interelectrode Capacitances
- Grid to plate: 160 pF
- Grid to cathode: 1500 pF
- Plate to cathode: Less than 1.0 pF

MECHANICAL

Operating Position: Tube axis vertical, either end up
- Overall Length: 17 max in
- Maximum Width: 24 max in
- Weight:
  - Uncrated: 190 lb
  - Crated: 355 lb

Terminal Connections: (See Dimensional Outline)

THERMAL

Ceramic-Insulator Temperature: 150 max °C
Metal-Surface Temperature: 100 max °C
Minimum Storage Temperature: -65 min °C

Water Flow

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>g/min</td>
<td>g/min</td>
<td>psi</td>
</tr>
<tr>
<td>To plate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For plate dissipation up to 50 kW (Average):</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>For plate dissipation of 150 kW (Average):</td>
<td>100</td>
<td>90</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA

Electronic Components and Devices Harrison, N.J.

DATA 1 6-66
### Water Flow (con'd)

<table>
<thead>
<tr>
<th>Flow</th>
<th>Absolute</th>
<th>Max. Pressure Differential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>Min.</td>
<td>for Typ. Flow</td>
</tr>
<tr>
<td>g/m</td>
<td>g/m</td>
<td>psi</td>
</tr>
<tr>
<td>To upper grid coolant course</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>To lower grid coolant course</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>To grid-cathode coolant course</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

**Resistivity of water at 25°C:**
- Through plate and grid coolant courses: 1 min MΩ-cm
- Through grid-cathode coolant course: 5 min MΩ-cm

**Water temperature from any outlet:**
- 70 max °C

**External gas pressure:**
- 65 max psig

**Maximum water pressure at any inlet:**
- 90 max psig

### TERMINAL DIAGRAM (Bottom View)

- **F1** - Filament Terminal (Inner)
- **FO** - Filament Terminal (Outer)
- **KURF** - Upper RF Cathode Terminal
- **KLRF** - Lower RF Cathode Terminal
- **GLIRF** - Lower RF Grid Input Terminal
- **GUORF** - Upper RF Grid Output Terminal
- **GLORF** - Lower RF Grid Output Terminal
- **PLRF** - Lower RF Plate Terminal
- **PURF** - Upper RF Plate Terminal

### PULSED RF AMPLIFIER

**Absolute-Maximum Ratings**

For a maximum "ON" time of 25 microseconds in any 2500-microsecond interval, for frequencies up to 450 MHz:

- **Peak Positive-Pulse Plate Voltage**: 40 kV
- **Peak Negative Grid Voltage**: 200 V
- **Peak Plate Current**: 500 A
- **Peak Cathode Current**
  - 750 A
- **DC Plate Current**: 5 A
- **DC Cathode Current**
  - 7.5 A
- **Plate Input (Average)**: 200 kW
- **Plate Dissipation (Average)**: 150 kW

**Typical Plate-Pulsed Operation**

With Rectangular Wave Shape in Cathode-Drive Circuit

With duty factor of 0.01 and pulse duration of 25 microseconds:

At 425 MHz:

- **Peak Positive-Pulse Plate-to-Grid Voltage**
  - 30000 V
  - 35000 V
- **Peak Cathode-to-Grid Voltage**
  - 60 V
  - 70 V
- **Peak Plate Current**
  - 310 A
  - 400 A
- **Peak Cathode Current**
  - 525 A
  - 680 A
- **DC Plate Current**
  - 3.1 A
  - 4 A
- **DC Cathode Current**
  - 5.2 A
  - 6.8 A

---

**DATA 1**

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.
Peak Driver Power Output... 250 350 kW
Useful Peak Power Output... 5 8 kW

The specified maximum filament current is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of tube life.

Measured between KLRF and KURF (See Terminal Diagram).

This pressure is related to the output-cavity pressurization when required to prevent corona or external flash-over.

With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 5% of the pulse duration.

Peak or average cathode current is the total of the peak or average plate current and the peak or average rectified grid current. (Pulses may not be coincident, hence they may not necessarily be added directly).

Preferably obtained from a cathode bias resistor.

The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

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

See Electrical Considerations - Filament or Heater.

See Cooling Considerations - Forced-Air Cooling.

See Cooling Considerations - Liquid Cooling.

See Classes of Service.

Characteristics Range Values

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Voltage</td>
<td></td>
<td>1</td>
<td>1.8</td>
</tr>
<tr>
<td>Input Strap-Resonant Frequency</td>
<td></td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>Output Strap-Resonant Frequency</td>
<td></td>
<td>240</td>
<td>280</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td></td>
<td>120</td>
<td>180</td>
</tr>
<tr>
<td>Grid to cathode</td>
<td></td>
<td>1250</td>
<td>1700</td>
</tr>
</tbody>
</table>

Note 1: With 1800 amperes through filament.

For additional information on this type, write for technical bulletin and application guide for RCA Super Power Tubes, ICE-279A available from:

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

DIMENSIONS IN INCHES

A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.
Beam Power Tube

MATRIX-TYPE CATHODE     CERMOLOX     FORCED-AIR COOLED

1350 Watts CW Power Output at 600 MHz

For Use at Frequencies up to 1215 MHz as a Linear RF Power Amplifier in Single-Sideband Suppressed-Carrier Service, as a Plate-Modulated RF Power Amplifier in Class C Telegraphy Service, as an RF Power Amplifier and Oscillator in Class C Telegraphy Service, and as an RF Power Amplifier in Class C FM Telephony Service.

ELECTRICAL

Heater, for Matrix-Type Oxide-Coated Unipotential Cathode

Voltage (AC or DC) ...................................................... 5.5 typ V
6.0 max V

Current at 5.5 volts .................................................... 17.3 A

Minimum Heating Time .................................................. 5 minutes

Mu-Factor, Grid No.2 to Grid No.1 .................................... 17

For plate volts = 2500, grid No.2 volts = 600,
and plate mA = 600

Direct Interelectrode Capacitances

Grid No.1 to plate .................................................... 0.181 max pF
Grid No.1 to cathode & heater ....................................... 42 pF
Plate to cathode & heater ............................................ 0.017 max pF
Grid No.1 to grid No.2 ................................................ 55 pF
Grid No.2 to plate ..................................................... 12 pF
Grid No.2 to cathode & heater .................................... 1.4 max pF

MECHANICAL

Operating Position ...................................................... Any
Maximum Overall Length .............................................. 3.34 in
Maximum Diameter ..................................................... 3.75 in
Terminal Connections ................................................... See Dimensional Outline
Radiator ................................................................. Integral part of tube
Weight (Approx.) ....................................................... 2 lb

THERMAL

Terminal Temperature .................................................. 250 max °C
Plate, grid No.2, grid No.1, cathode, and heater
Plate-Seal Temperature ............................................... 250 max °C

See Dimensional Outline for temperature-measurement points

Forced-Air Cooling

Air Flow:

Through radiator - Adequate air flow to limit the plate-seal temperature to 250°C should be delivered by a blower, such as Rotron® AXIMAX 2, KS-408 or equivalent, through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. See graph, Typical Cooling Characteristics.

To Plate, Grid-No.2, Grid-No.1, Heater-Cathode, and Heater 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 to the Heater-Cathode and Heater Terminals when only heater 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)

G1 - Grid-No.1-Terminal
Contact Surface
G2 - Grid-No.2-Terminal
Contact Surface
H - Heater-Terminal
Contact Surface
H.K - Heater & Cathode-Terminal
Contact Surface
P - Plate-Terminal
Contact Surface

LINEAR RF POWER AMPLIFIER, CLASS AB1

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 Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 1215 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>3000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>1.0 A</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current</td>
<td>0.2 A</td>
</tr>
<tr>
<td>Max.-Signal Plate Input</td>
<td>2500 W</td>
</tr>
<tr>
<td>Max.-Signal Grid-No.2 Input</td>
<td>50 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1500 W</td>
</tr>
</tbody>
</table>

Maximum Circuit Values

Grid-No.1 Circuit Resistance Under Any Condition
- With fixed bias                      .5000 Ω
- With fixed bias (in Class AB1 operation) Not recommended
- With cathode bias                    Not recommended

Grid-No.2 Circuit Impedance          See footnote g
Plate Circuit Impedance              See footnote h

Typical CCS Class AB1 "Single-Tone" Operation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 60 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2250 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>700 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-50 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>0.2 A</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current</td>
<td>0 A</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>1100 Ω</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>0.9 A</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current</td>
<td>0.045 A</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current</td>
<td>0 A</td>
</tr>
<tr>
<td>Max.-Signal Peak RF Grid-No.1 Voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0 W</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>1000 W</td>
</tr>
</tbody>
</table>

DATA 1

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
PLATE-MODULATED RF POWER AMP.-Class C Telephony

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

Maximum CCS Ratings, Absolute Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.85 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.2 A</td>
</tr>
<tr>
<td>Plate Input</td>
<td>1700 W</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>35 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1000 W</td>
</tr>
</tbody>
</table>

Maximum Circuit Value

Grid-No.1-Circuit Resistance
Under any condition: 5000 Ω

Typical CCS Operation
In a Grid-Drive Circuit at 600 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>500 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-75 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.9 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.02 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.07 A</td>
</tr>
<tr>
<td>Output Circuit Efficiency (Approx.)</td>
<td>90 %</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>70 W</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>1050 W</td>
</tr>
</tbody>
</table>

Maximum Circuit Value

Grid-No.1-Circuit Resistance
Under any condition: 5000 Ω

RF POWER AMPLIFIER & OSC.-Class C Telegraphy

RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS Ratings, Absolute Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>3000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.0 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.2 A</td>
</tr>
<tr>
<td>Plate Input</td>
<td>2500 W</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>50 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1500 W</td>
</tr>
</tbody>
</table>
**Typical CCS Operation**

*In a Grid-Drive Circuit at 600 MHz*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1800</td>
<td>2000</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-75</td>
<td>-75</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.75</td>
<td>0.83</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.015</td>
<td>0.015</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>650</td>
<td>800</td>
</tr>
</tbody>
</table>

**Characteristics Range Values**

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>16.3</td>
<td>18.2</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td>0.181</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to plate.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater.</td>
<td>37</td>
<td>46</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater.</td>
<td>0.017</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2.</td>
<td>46</td>
<td>62</td>
</tr>
<tr>
<td>Grid No.2 to plate.</td>
<td>9.9</td>
<td>13.1</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater.</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Mu-Factor, Grid No.2 to Grid No.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>-140</td>
<td>V</td>
</tr>
<tr>
<td>Cutoff Grid-No.1 Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>1.6</td>
<td>12</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>-28</td>
<td>mA</td>
</tr>
<tr>
<td>6.</td>
<td>1.7</td>
<td>1000</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>7.</td>
<td>1.8</td>
<td>500</td>
</tr>
<tr>
<td>Low-Frequency Vibration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-Frequency Vibration</td>
<td>(See Note 9)</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: With 5.5 volts ac on heater.

Note 2: With external flat metal shield having diameter of 8", at center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

Note 3: With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

Note 4: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 600 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 amper.

Note 5: With dc plate voltage of 3000 volts, dc grid-No.2 voltage of 1000 volts, and dc grid-No.1 voltage adjusted to give a plate current of 20 mA.

Note 6: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 500 volts, and dc grid-No.1 voltage adjusted to give a plate current of 0.6 ampere.

Note 7: In a CW cathode-driven amplifier circuit at 600 MHz and for conditions: dc plate voltage at 2500 volts, dc grid-No.2 voltage of 700 volts, and dc grid-No.1 voltage adjusted to give a plate current of 1.0 ampere.

Note 8: As specified in MIL-E-IE Test Method 1031, and with plate voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 mA, and plate load resistor of 2000 ohms.

Note 9: As specified in MIL-E-IE Test Method 1031.
o With external metal shield having diameter of 8", and center hole approximately 3" in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

b With external flat metal shield having diameter of 8", and center hole approximately 2-3/8" in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

c Rotron Mfg. Co., Inc., Woodstock, N. Y.

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

d See Electrical Considerations — Filament or Heater.

e See Cooling Considerations — Forced-Air Cooling.

f See Classes of Service.

g See Electrical Considerations — Grid-No.2 Voltage Supply.

h See Electrical Considerations — Plate Voltage Supply.
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 Band - 3.7806
- b. Plate Terminal - 3.2606
- c. Grid-No.2 Terminal - 3.0805
- d. Grid-No.1 Terminal - 2.3375
- e. Heater-Cathode Terminal - 1.7445
- f. Heater Terminal - 0.6945

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 heater-cathode 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 volumes. Diameters of stippled areas above air-cooled radiator, plate terminal contact surface, and grid-No.2 terminal contact surface shall not be greater than its associated diameter.
Only the fixed method of mounting is recommended. The fixed method offers simpler design and construction with resulting lower cost. It especially simplifies the associated hollow-cylinder cavity construction, if used. On the other hand, it requires greater finger stock accommodation. As used here, accommodation is defined as the amount of flexing required by the fingers of the finger contact strip to accept tubes at all the extremes of mechanical variation. Accommodation, which must be provided for in the fixed method, is determined from the Dimensional Outline and its associated notes. It may be calculated as the difference between the minimum terminal diameter on the Dimensional Outline (maximum finger opening) and the associated concentricity gauge aperture opening in the appropriate note (minimum finger opening).
Typical Constant-Current Characteristics
With Grid-No.2 Volts = 500

$E_C = 5.5\text{ VOLTS}$
$\text{GRID-No.2 VOLTS }= 500$
$I_B = \text{PLATE AMPERES}$
$I_{C1} = \text{GRID-No.1 AMPERES}$
$I_{C2} = \text{GRID-No.2 AMPERES}$

DATA 4
RADIO CORPORATION OF AMERICA
Electronic Components and Devices    Harrison, N. J.
Typical Constant-Current Characteristics
With Grid-No.2 Volts = 700

\[ E_c = 5.5 \text{ VOLTS} \]
\[ \text{GRID-N}\#2 \text{ VOLTS} = 700 \]
\[ I_b = \text{PLATE AMPERES} \]
\[ I_{C1} = \text{GRID-N}\#1 \text{ AMPERES} \]
\[ I_{C2} = \text{GRID-N}\#2 \text{ AMPERES} \]
Typical Cooling Characteristics

AIR FLOW THROUGH RADIATOR IN EITHER DIRECTION.
MAXIMUM PLATE-SEAL TEMPERATURE = 250°C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PRESSURE DROP — INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.35</td>
</tr>
<tr>
<td>B</td>
<td>0.6</td>
</tr>
<tr>
<td>C</td>
<td>1.5</td>
</tr>
<tr>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

MAXIMUM ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMPERATURE OF 45°C

PER CENT OF MAXIMUM RATED PLATE DISSIPATION FOR EACH CLASS OF SERVICE

DATA 5
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Tuning Characteristics

GRID No.1 (G1) TO GRID No. 2 (G2)
GRID No. 1(G1) TO CATHODE (K)

FREQUENCY — MHz

CAVITY LENGTH L — INCHES

1/4 MODE

3/4 MODE

10

5

0

500

1000

1500

Zo = 5.9 OHMS

Zo = 13.4 OHMS

RCORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 6
9-67
Tuning Characteristics

GRID No. 2 (G2) TO PLATE (P)

L' = 13
L = 13
D = 3.7 OD
D' = 4.5 ID
Z_0 = 24.4 OHMS

CAVITY LENGTH L - INCHES

FREQUENCY - MHz

0 500 1000 1500

DATA 6

RADIO CORPORATION OF AMERICA
Electronic Components and Devices  Harrison, N. J.
Beam Power Tube

CERMOLOX
Matrix Cathode
Forced-Air Cooled
17 kW Pulsed RF Output
Full Input to 1215 MHz
UHF Pulsed RF Amplifier

For Use In Airborne, Shipboard, Mobile,
Stationary Equipment

ELECTRICAL

Heater

Type .......... Matrix, Oxide Coated Unipotential Cathode
Voltage (ac or dc) ................. 6.3 V
Current at 6.3 V .................. 3.2 A
Minimum heating time ............ 80 s

MAXIMUM RATINGS, Absolute-Maximum Values
For frequencies up to 1215 MHz and for a maximum “ON” time
as specified in any 1000-microsecond interval.
Peak Positive-Pulse Plate Voltage .......... 7000 V
DC Plate Voltage .................. 4000 V
DC or Peak Positive-Pulse
  Grid-No. 2 Voltage ................. 1000 V
Negative Pulse Grid-No. 1 Voltage ....... 200 V
DC Plate Current During Pulse
  With 5-microsecond “ON” time .......... 6 A
DC Plate Current
  With 5-microsecond “ON” time .......... 0.050 A
Plate Dissipation (Average) ............. 125 W
Useful Peak Power Output
  With 5-microsecond “ON” time .......... 17000 W

MECHANICAL

Operating Position ..................... Any
Weight (Approx.) .................. 2 oz (0.06 kg)

THERMAL

Seal Temperature ........... 250 max. °C
Radiator Core ................. 250 max. °C

See Electrical Considerations—Filament or Heater, under RCA
Transmitting Tube Operating Considerations given at front of
this section.

Keep all stippled regions clear. Do not allow contacts or cir-
cuit components to protrude into these annular regions.

Detailed performance and application information is available
through your RCA Sales Office, Distributor, or write to RCA
Commercial Engineering, Harrison, N.J. 07029.
### Dimensional Outline

- **Radiator**
- **Radiator Core Temp. Measurement Point**
- **Plate Terminal**
- **Grid No. 2 Terminal**
- **Grid No. 1 Terminal**
- **Heater-Cathode Terminal**
- **Heater Terminal**

**Ceramic**

**Footnote(s)**

**Electrode Seal Temperature Measurement Point**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>1.250 ± 0.15</td>
<td>31.75 ± 0.38</td>
</tr>
<tr>
<td>B Dia.</td>
<td>1.100 ± 0.15</td>
<td>27.94 ± 0.38</td>
</tr>
<tr>
<td>C Dia.</td>
<td>1.000 ± 0.15</td>
<td>25.40 ± 0.38</td>
</tr>
<tr>
<td>D Dia.</td>
<td>0.750 ± 0.15</td>
<td>19.05 ± 0.38</td>
</tr>
<tr>
<td>E Dia.</td>
<td>0.500 ± 0.017</td>
<td>12.70 ± 0.43</td>
</tr>
<tr>
<td>F Dia.</td>
<td>0.250 ± 0.010</td>
<td>6.35 ± 0.25</td>
</tr>
<tr>
<td>G Dia.</td>
<td>0.070 Max.</td>
<td>1.78 Max.</td>
</tr>
<tr>
<td>H</td>
<td>0.054 Min.</td>
<td>1.37 Min.</td>
</tr>
<tr>
<td>J</td>
<td>2.080 ± 0.050</td>
<td>52.8 ± 1.2</td>
</tr>
<tr>
<td>K</td>
<td>0.050 Min.</td>
<td>1.27 Min.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>0.035 Min.</td>
<td>0.89 Min.</td>
</tr>
<tr>
<td>N</td>
<td>1.335 ± 0.045</td>
<td>33.91 ± 1.14</td>
</tr>
<tr>
<td>P</td>
<td>1.230 ± 0.030</td>
<td>31.22 ± 0.76</td>
</tr>
<tr>
<td>R</td>
<td>0.370 ± 0.020</td>
<td>9.40 ± 0.50</td>
</tr>
<tr>
<td>S</td>
<td>0.175 ± 0.015</td>
<td>4.45 ± 0.38</td>
</tr>
<tr>
<td>T</td>
<td>0.025 ± 0.025</td>
<td>0.64 ± 0.63</td>
</tr>
<tr>
<td>U</td>
<td>0.200 Min.</td>
<td>5.08 Min.</td>
</tr>
<tr>
<td>V</td>
<td>0.060 Min.</td>
<td>1.52 Min.</td>
</tr>
<tr>
<td>W</td>
<td>0.090 Min.</td>
<td>2.29 Min.</td>
</tr>
<tr>
<td>X</td>
<td>0.120 Min.</td>
<td>3.05 Min.</td>
</tr>
<tr>
<td>Y</td>
<td>0.095 Min.</td>
<td>2.41 Min.</td>
</tr>
</tbody>
</table>

**Footnote(s)**

- M71
- ULM-2529V
Beam Power Tube

FORCED-AIR COOLED UHF GRID-DRIVE OPERATION
INTEGRAL RADIATOR 300 WATTS UHF TV OUTPUT AT 890 Mc
MATRIX-TYPE CATHODE 410 WATTS PEP OUTPUT AT 30 Mc
DISTRIBUTED AMPLIFIER SERVICE TO 500 Mc

For Use as an RF Power Amplifier in Television and Single-Sideband Suppressed-Carrier Service and as a Broadband UHF Amplifier in Mobile and Stationary Equipment.

Electrical:

Unipotential Cathode, Matrix-Type:
Voltage (AC or DC) 6.3 volts
Current at heater volts = 6.3 3.5 amp
Minimum heating time 60 sec
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 450, grid-No.2 volts = 325 and plate amperes = 1.2 12

Direct Interelectrode Capacitances:
Grid No.1 to plate 0.062 max. pf
Grid No.1 to cathode 20 pf
Plate to cathode 6.2 max. pf
Grid No.1 to grid No.2 19 pf
Grid No.2 to plate 2.2 pf
Grid No.2 to cathode 590 max. pf

Mechanical:

Operating Position Any
Maximum Overall Length 2.19"
Maximum Diameter 2.262"
Weight (Approx.) 4.5 oz
Radiator Integral part of tube
Terminal Connections (See Dimensional Outline):

Thermal:

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

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

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
DATA 1
4-65
To Plate, Grid-No. 1, Grid-No. 2, Cathode, and Heater Terminals — A sufficient quantity of air should be directed at these terminals so that their temperature does not exceed the specified maximum value of 250° C.

During Standby Operation — Cooling air is required when heater voltage is applied to the tube.

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

**RF POWER AMPLIFIER — Class B Television Service**

Synchronizing-level conditions per tube unless otherwise specified.

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200  volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>400   volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>375   ma</td>
</tr>
<tr>
<td>DC Grid-No. 1 Current</td>
<td>100   ma</td>
</tr>
<tr>
<td>Grid-No. 2 Input.</td>
<td>8     watts</td>
</tr>
<tr>
<td>Plate Dissipation.</td>
<td>400   watts</td>
</tr>
</tbody>
</table>

**Typical CCS Operation in Grid-Drive Circuit:**

For frequency of 890 Mc and Bandwidth of 8.5 Mc.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2000  volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>400   volts</td>
</tr>
<tr>
<td>DC Grid-No. 1 Voltage</td>
<td>-55   volts</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>30    ma</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>20    ma</td>
</tr>
<tr>
<td>DC Grid-No. 2 Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>1.3   ma</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>1     ma</td>
</tr>
<tr>
<td>DC Grid-No. 1 Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0     ma</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0     ma</td>
</tr>
<tr>
<td>Driver Power Output:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>30    watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>17    watts</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>80    %</td>
</tr>
<tr>
<td>Useful Power Output:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>300   watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>170   watts</td>
</tr>
</tbody>
</table>

**LINEAR RF POWER AMPLIFIER**

Single-Sideband Suppressed-Carrier Service

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

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200  volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>400   volts</td>
</tr>
<tr>
<td>DC Grid-No. 1 Voltage</td>
<td>-100  volts</td>
</tr>
</tbody>
</table>
DC Plate Current at Peak of Envelope .... 450\(^a\) ma
DC Grid-No.1 Current .................. 100 ma
Grid-No.2 Input ....................... 8 watts
Plate Dissipation ...................... 400 watts

Maximum Circuit Values:
Grid-No.1 Circuit Resistance ......... 30000 ohms
Grid-No.2—Circuit Impedance See Note \(b\)
Plate—Circuit Impedance See Note \(f\)

Typical CCS Operation with "Two-Tone Modulation":

\* Typical CCS Operation with "Two-Tone Modulation":

\(\text{At 30 Mc}\)
DC Plate Voltage ....................... 2000 volts
DC Grid-No.2 Voltage ............... 400 volts
DC Grid-No.1 Voltage .......... -44 volts
Zero-Signal DC Plate Current ........ 100 ma
Effective RF Load Resistance ........ 3200 ohms
DC Plate Current at Peak of Envelope ........ 335 ma
Average DC Plate Current .......... 250 ma
DC Grid-No.2 Current at Peak of Envelope ........ 20 ma
Average DC Grid-No.2 Current .......... 13 ma
DC Grid-No.1 Current .......... 0 ma
Peak-of-Envelope Driver Power Output (Approx.) ........ 0.3 watt
Output—Circuit Efficiency (Approx.) .......... 92 %
Distortion Products Level:
Third order ......................... 30 db
Fifth order .......................... 34 db
Useful Power Output (Approx.):
Average ............................... 205 watts
Peak of envelope .................... 410 watts

\(\text{a} \quad \text{The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as is obtained in "Single-Tone" operation, is 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.}\)

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

\(\text{b} \quad \text{See Electrical Considerations—Filament or Heater}\)
\(\text{c} \quad \text{See Cooling Considerations—forced-Air Cooling}\)
\(\text{d} \quad \text{See Classes of Service}\)
\(\text{e} \quad \text{See Electrical Considerations—Grid-No.2 Voltage Supply}\)
\(\text{f} \quad \text{See Electrical Considerations—Plate Voltage Supply}\)
DIMENSIONAL OUTLINE

PLATE TERMINAL CONTACT SURFACE (RADIATOR)

PLATE CORE TEMPERATURE MEASUREMENT POINT

NOTE 4 MESH RING

CATHODE-HEATER FLANGE TERMINAL CONTACT SURFACE (NOTE 1f)

REFERENCE LINE

NOTE 1a

CERAMIC

DIMENSIONS IN INCHES

A - 2.19 max.
B - 1.660 ± 0.060
C - 0.610 ± 0.020
D - 2.262 max. diam.
E - 0.710 min.
F - 0.470 max.
G - 0.355 max.
H - 0.065 max.
J - 0.024 max.
K - 1.435 max. diam.
L - 0.400 min. diam.

M - 0.500 ± 0.010

Note 1d

N - 0.300 max.

P - 0.200 max.

Q - 1.625 ± 0.015 min.

Note 1e

R - 0.885 max.

S - 45° ± 5°

T - 0.175 ± 0.005 diam.

U - 0.939 diam.

V - 2.000 diam.

W - 0.081 ± 0.002 diam.

Note 2b

X - 0.081 ± 0.002 diam.

Note 2c

Y - 0.126 ± 0.002 diam.

Note 2a

Z - 0.245 min. diam.

AA - 0.200 min.

AB - 0.325 min.

AC - Note 1b

AD - Note 1c

AE - 0.085 max.

DATA 2

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Note 1: Concentricity between the various diameters on the major tube axis is such that the tube will enter a gauge having suitably spaced concentric apertures and posts of the following diameters:

(a) Base seat—1.500
(b) Flared flange of cathode-heater cylinder terminal—0.680
(c) Cathode-heater cylinder terminal (ID)—0.400
(d) Cathode-heater cylinder terminal (OD)—0.525
(e) Radiator—1.660
(f) Cathode-heater flange terminal contact surface—1.760

Note 2: Concentricity of the base pins is such that the tube will enter the gauge in Note 1 having suitably spaced apertures of the following diameters:

(a) Grid-No.1 pins—0.1450
(b) Heater pin—0.0830 (1.123 Dia x 82° CSK)
(c) Grid-No.2 pins—0.0930

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

Note 4: RF gasket, such as METEX* No. A2733, or equivalent.

* Metex Electronics Corp., Walnut Ave., Clark, N.J.
TYPICAL COOLING CHARACTERISTICS

INCOMING AIR TEMPERATURE—24°C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION WATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
</tr>
<tr>
<td>C</td>
<td>300</td>
</tr>
<tr>
<td>D</td>
<td>400</td>
</tr>
</tbody>
</table>

DIRECTION OF AIR FLOW

<table>
<thead>
<tr>
<th>PLATE CORE TEMPERATURE °C (SOLID LINE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0  0.5  1  1.5  2  2.5  3</td>
</tr>
</tbody>
</table>

PRESSURE DROP IN INCHES OF WATER (DASHED LINE)

DATA 3

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.
TYPICAL CHARACTERISTICS

HEATER VOLTS = 6.3
GRID No.2 VOLTS = 400
GRID No.1 VOLTS = E_{C1}

I_{C1} = ---
I_{C2} = ---

GRID No.1 (or GRID No. 2) MILLIAMPERES

PLATE VOLTS
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 6.3
GRID No. 2 VOLTS = 400
GRID No. 1 VOLTS = $E_C$
Beam Power Tube

CERMOLOX Matrix Cathode 13 kV, 30 Amp.
Ruggedized Pulse Modulator Conduction Cooled

ELECTRICAL
Heater for Matrix Type, Oxide-Coated
Unipotential Cathode:
Voltage (ac or dc) .................. 5.5 V
Current at 5.5 volts ................ 17.3 A
Minimum heating time .............. 180 s
Mu-Factor, grid No. 1 to grid No. 2 .......... 16

MAXIMUM RATINGS, Absolute-Maximum Values
DC Plate Voltage .................. 13 kV
Instantaneous Peak Plate Voltage .......... 17 kV
(Pulse duration < 0.1 s)

DC Peak
Pulsed-Grid-No. 2 Voltage .............. 1000 V
DC Grid-No. 1 Voltage ................. −300 V
Peak Positive-Pulse
Grid-No. 1 Voltage .................. 100 V
Peak Plate Current .................. 30 A
DC Plate Current .................. 1.5 A
Plate Dissipation (Average) .......... 1.5 kW

MECHANICAL
Operating Position ....................... Any
Weight (Approx.) .................... 1-1/2 lb (0.68 kg)

THERMAL
Terminal Temperature (All Terminals) ....... 250 Max. °C

See Electrical Considerations—Filament or Heater, under RCA Transmitting Tube Operating Considerations given at front of this section.

See dimensional outline for temperature measurement points.

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

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
### DIMENSIONAL OUTLINE

#### PLATE TERMINAL CONTACT SURFACE

#### GRID-No. 2 TERMINAL CONTACT SURFACE

#### GRID-No. 1 TERMINAL CONTACT SURFACE

#### HEATER-CATHODE TERMINAL CONTACT SURFACE

#### HEATER TERMINAL CONTACT SURFACE

---

**FOOTNOTE (e)**

**SUM-1040V**

---

#### TABLE: DIMENSIONAL OUTLINE

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.31 Max.</td>
<td>84.1 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.020 ± .010</td>
<td>76.71 ± .25</td>
</tr>
<tr>
<td>C Dia.</td>
<td>2.317 ± .010</td>
<td>58.85 ± .25</td>
</tr>
<tr>
<td>D Dia.</td>
<td>1.717 ± .007</td>
<td>43.61 ± .18</td>
</tr>
<tr>
<td>E Dia.</td>
<td>0.713 ± .012</td>
<td>18.11 ± .30</td>
</tr>
<tr>
<td>F Dia.</td>
<td>2.265 ± .003</td>
<td>57.53 ± .08</td>
</tr>
<tr>
<td>G</td>
<td>0.725 Min.</td>
<td>18.42 Min.</td>
</tr>
<tr>
<td>H</td>
<td>2.780 ± .040</td>
<td>70.61 ± 1.02</td>
</tr>
<tr>
<td>J</td>
<td>2.185 ± .030</td>
<td>55.50 ± .76</td>
</tr>
<tr>
<td>K</td>
<td>0.200 ± .025</td>
<td>5.08 ± .64</td>
</tr>
<tr>
<td>M</td>
<td>0.370 ± .030</td>
<td>9.40 ± .76</td>
</tr>
<tr>
<td>N</td>
<td>0.460 ± .030</td>
<td>11.68 ± .64</td>
</tr>
<tr>
<td>P Dia.</td>
<td>0.755 ± .010</td>
<td>19.18 ± .25</td>
</tr>
</tbody>
</table>

**CERAMIC**
**Beam Power Tube**

**CERMOLOX®**

**INTEGRAL LOUVERED-FIN RADIATOR**

**THORIATED-TUNGSTEN MESH FILAMENT**

**FORCED-AIR COOLED**

For Single-Sideband Service in Stationary and Portable Equipment. Rated as a Linear RF Power Amplifier in Class AB1 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)\(^a\) \(\{4.5 \text{ to } 4.75 \text{ typ } V\) \(5.0 \text{ max } V\)

Current:

- Typical value at 4.5 V \(125 \text{ A}\)
- Maximum value for starting, even momentarily \(300 \text{ A}\)
- Cold Resistance \(0.005 \text{ k } \Omega\)
- Minimum heating time \(15 \text{ s}\)

**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 Inter-electrode Capacitances**

- Grid No. 1 to plate \(0.60 \text{ max } \mu \text{F}\)
- Grid No. 1 to filament \(0.11 \text{ max } \mu \text{F}\)
- Plate to filament \(0.11 \text{ max } \mu \text{F}\)
- Grid No. 1 to grid No. 2 \(65 \text{ pF}\)
- Grid No. 2 to plate \(13 \text{ pF}\)
- Grid No. 2 to filament \(3.3 \text{ max } \mu \text{F}\)

**MECHANICAL**

- Operating Position \(\text{Vertical, either end up}\)
- Maximum Overall Length \(5.65 \text{ in}\)
- Maximum Diameter \(6.17 \text{ in}\)
- Terminal Connections \(\text{See Dimensional Outline}\)
- Radiator \(\text{Integral part of tube}\)
- Weight (Approx.) \(10 \text{ lb}\)

**THERMAL**

- Terminal Temperature \(250 \text{ max } ^\circ \text{C}\)
- Plate-Core Temperature \(250 \text{ max } ^\circ \text{C}\)

See Dimensional Outline for temperature-measurement points

**Forced-Air Cooling**

**Air Flow**

Through Radiator — Adequate air flow to limit the plate-core temperature to 250\(^\circ\) 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.

\(^a\) Electrial Filamentary Cathode, Thoriated-Tungsten mesh type

\(^\text{b}\) Voltage (ac or dc)\(^a\) \(\{4.5 \text{ to } 4.75 \text{ typ } V\) \(5.0 \text{ max } V\)

\(^\text{c}\) Direct Inter-electrode Capacitances

\(^\text{d}\) Mu-Factor, Grid No. 2 to Grid No. 1 for plate volts = 2000, grid-No. 2 volts = 1375, and dc plate amperes = 9

\(^\text{e}\) See Dimensional Outline for temperature-measurement points

\(^\text{f}\) Forced-Air Cooling
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)

G1 - Grid-No. 1-Terminal Contact Surface
G2 - Grid-No. 2-Terminal Contact Surface
F - Filament-Terminal Contact Surface
KF - Cathode-Filament-Terminal Contact Surface
P - Plate-Terminal Contact Surface

LINEAR RF POWER AMPLIFIER

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 ......................................... 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 AB1 operation) ................. 25,000 Ω
  Cathode bias .............................................. Not recommended

Grid-No. 2 Circuit Impedance .......................... See footnote
Plate Circuit Impedance ................................. See footnote

Typical Class AB1 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

DATA 1
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Average DC Grid-No.2 Current: 0.07 A
Peak-Envelope Driver Power Output (Approx.): See footnote
Output Circuit Efficiency (Approx.): 90%
Useful Power Output (Approx.)
Average: 5000 W
Peak Envelope: 10 kW

LINEAR RF POWER AMPLIFIER
AM TELEPHONY SERVICE

Carrier conditions for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1650 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-750 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>500 mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>150 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>10 kW</td>
</tr>
</tbody>
</table>

Typical Class AB CCS Operation
In a cathode drive circuit, at 400 Mc/s

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-160° V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.4 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.005 W</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td>75 W</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>90 %</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>2000 W</td>
</tr>
</tbody>
</table>

a) Measured at tube terminals.
b) 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.
c) 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.
d) 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.
e) 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.
f) See Cooling Considerations—Forced-Air Cooling.
g) See Classes of Service.
h) See Electrical Considerations—Grid-No.2 Voltage Supply.
j) See Electrical Considerations—Plate Voltage Supply.
DIMENSIONAL OUTLINE

PLATE TERMINAL CONTACT SURFACE 3.250 ± .015 DIA.
NOTE lb

GRID-No. 2 TERMINAL CONTACT SURFACE 3.028 ± .014 DIA.
NOTE lc

GRID-No. 1 TERMINAL CONTACT SURFACE 2.319 ± .022 DIA.
NOTE lb & 2

CATHODE-FILAMENT TERMINAL CONTACT SURFACE
L850 ± .010 DIA.
NOTES lg & 2

FILAMENT TERMINAL CONTACT SURFACE .750 ± .010 DIA.
NOTES lg & 2

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.

DATA 2
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
PREferred MoUnTING ARRANGEMENT

See Detail

REFERENCE LINE

DETAIL

.020 WIDE x .425 DEEP
(6 SLOTS EQ. SP.)

.431 DIA.

.761 DIA.

.800

.531 -.002 DIA.

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

**INCOMING AIR TEMPERATURE—25°C**

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4000</td>
</tr>
<tr>
<td>B</td>
<td>6000</td>
</tr>
<tr>
<td>C</td>
<td>8000</td>
</tr>
<tr>
<td>D</td>
<td>10000</td>
</tr>
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</table>

**DIRECTION OF AIR FLOW**

**PLATE CORE TEMPERATURE °C (SOLID LINE)**

<table>
<thead>
<tr>
<th>PRESSURE DROP IN INCHES OF WATER (DASHED LINE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electronic Components and Devices  Harrison, N. J.
Typical Constant-Current Characteristics
For Grid-No.2 Voltage = 1500 Volts

FILAMENT VOLTS = 4.5 TO 4.75
GRID-No. 2 VOLTS = 1500
PLATE AMPERES = $i_b$
GRID-No. 1 AMPERES = $i_c1$
GRID-No. 2 AMPERES = $i_c2$
Cavity Tuning Characteristics

GRID No. 1 TO CATHODE

GRID No. 1 TERMINAL
CATHODE-FILAMENT TERMINAL
2.000 OD
2.500 ID
Ze = 13 OHMS

1/4 MODE
3/4 MODE

GRID No. 2 TO PLATE

GRID No. 2 TERMINAL
PLATE TERMINAL
3.268 OD
4.906 ID
Ze = 25 OHMS

1/4 MODE
3/4 MODE

FREQUENCY — Mc/s

DATA 5
12-65
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Cavity Tuning Characteristics

- GRID NO. 1 TO GRID NO. 2
- 3/4 MODE
- 1/2 MODE
- 1/4 MODE

Frequency - Mc/s

Cavity Length L - Inches

15 20 25 30
Beam Power Tube

CERMOLOX 17 kV, 40 Amperes  Ruggedized
Matrix Cathode  Pulse Modulator  Conduction Cooled

ELECTRICAL
Heater\(^a\), for Matrix-Type Oxide-Coated
Unipotential Cathode:
- Voltage (ac or dc) \(22 \pm 2\) V
- Current at 22 volts \(12.6\) A
- Minimum heating time \(180\) s
- Mu-Factor, grid No.2 to grid No.1 \(6\)

MAXIMUM CSS RATINGS, Absolute-Maximum Values
- DC Plate Voltage \(17^b\) kV
- Instantaneous Peak Plate Voltage (Pulse duration < 0.1 s) \(22^b\) kV
- DC Peak Pulsed Grid-No.2 Voltage \(2000\) V
- DC Grid No.1 Voltage \(-600\) V
- Peak Positive-Pulse Grid No.1 Voltage \(150\) V
- Peak Plate Current \(40^c\) A
- DC Plate Current \(5\) A
- Plate Dissipation (Average) \(7.5\) kW

MECHANICAL
- Operating Position Any
- Weight (Approx.) \(5\) lb (2.3 kg)

THERMAL
- Terminal Temperature (All terminals) \(250\) max. °C
- Plate-Core Temperature \(250\) max. °C

\(^a\) See Electrical Considerations – Filament or Heater under RCA Transmitting Tube Operating Considerations given at front of this section.

\(^b\) See dimensional outline for temperature measurement points.

\(^c\) Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
**DIMENSIONAL OUTLINE**

**DIMENSION** | **INCHES** | **MILLIMETERS**
--- | --- | ---
A | 6.175 Max. | 156.85 Max.
B Dia. | 3.905 ± .015 | 99.19 ± .38
C Dia. | 3.305 ± .015 | 83.95 ± .38
D Dia. | 2.695 ± .015 | 68.45 ± .38
E Dia. | 1.973 ± .007 | 49.21 ± .18
F Dia. | 2.095 ± .015 | 53.21 ± .38
G Dia. | 3.201 ± .002 | 81.305 ± .051
H | 0.590 ± .010 | 14.99 ± .25
J | 2.593 Min. | 65.86 Min.
K | 4.470 ± .030 | 113.54 ± .76
M | 0.320 ± .020 | 8.13 ± .51
N | 0.630 ± .020 | 16.00 ± .51
P | 0.940 ± .020 | 23.88 ± .51
Beam Power Tube

CERMOLOX
Oxide-Coated Cathode
Forced-Air Cooled
Linear RF Power Amplifier

Ruggedized
80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

ELECTRICAL
Heater for Matrix-Type, Oxide-Coated, Unipotential Cathode:

Voltage (ac or dc) ............... 26.5 ± 10% V
Current at 26.5 volts .......... 0.54 A
Minimum heating time .......... 60 s
Mu-Factor, Grid No.2 to Grid No.1 .... 18

MAXIMUM CCS RATINGS, Absolute-Maximum Values

Up to 1215 MHz
DC Plate Voltage ................. 1000 V
DC Grid-No.2 Voltage ........... 300 V
DC Grid-No.1 Voltage .......... −100 V
DC Plate Current ............... 200 mA
Plate Dissipation .............. 150 W

MECHANICAL
Operating Position ............... Any
Weight (Approx.) ............... (0.06 kg) 2 oz

THERMAL

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

a See Dimensional Outline for temperature measurement points.
b Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
### Dimensional Outline

**Radiator**

**Plate Terminal**

**Grid-No.2 Terminal**

**Grid-No.1 Terminal**

**Heater-Cathode Terminal**

**Axial Pin**

**Heater Terminal**

---

**See Footnote (b)**

**Ceramic**

- **Temperature Measurement Point**

---

**92LM-2327V**

#### Dimensional Outline

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.270 Max.</td>
<td>57.66 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>1.625 ± .015 Max.</td>
<td>41.28 ± .38 Max.</td>
</tr>
<tr>
<td>C</td>
<td>1.840 ± .032</td>
<td>46.74 ± .81</td>
</tr>
<tr>
<td>D</td>
<td>1.030 ± .030</td>
<td>26.16 ± .76</td>
</tr>
<tr>
<td>E</td>
<td>0.750 ± .018</td>
<td>19.05 ± .38</td>
</tr>
<tr>
<td>F</td>
<td>0.030 Min.</td>
<td>0.76 Min.</td>
</tr>
<tr>
<td>G</td>
<td>0.165 Min.</td>
<td>4.19 Min.</td>
</tr>
<tr>
<td>H</td>
<td>0.120 Min.</td>
<td>3.05 Min.</td>
</tr>
<tr>
<td>J</td>
<td>0.140 Min.</td>
<td>3.56 Min.</td>
</tr>
<tr>
<td>K</td>
<td>0.600 Min.</td>
<td>15.24 Min.</td>
</tr>
<tr>
<td>M</td>
<td>0.370 ± .020</td>
<td>9.40 ± .51</td>
</tr>
<tr>
<td>N</td>
<td>0.085 Min.</td>
<td>2.14 Min.</td>
</tr>
</tbody>
</table>

#### Dimensional Outline

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Dia.</td>
<td>0.480 Min.</td>
<td>12.19 Min.</td>
</tr>
<tr>
<td>R Dia.</td>
<td>0.260 Max.</td>
<td>6.60 Max.</td>
</tr>
<tr>
<td>S Dia.</td>
<td>1.085 Min.</td>
<td>27.56 Min.</td>
</tr>
<tr>
<td>T Dia.</td>
<td>0.985 Min.</td>
<td>25.02 Min.</td>
</tr>
<tr>
<td>U Dia.</td>
<td>0.735 Min.</td>
<td>18.67 Min.</td>
</tr>
<tr>
<td>V</td>
<td>0.060 Min.</td>
<td>1.52 Min.</td>
</tr>
<tr>
<td>W</td>
<td>0.090 Min.</td>
<td>2.29 Min.</td>
</tr>
<tr>
<td>X</td>
<td>0.025 ± .025</td>
<td>0.64 ± .64</td>
</tr>
<tr>
<td>Y</td>
<td>0.175 ± .015</td>
<td>4.45 ± .38</td>
</tr>
<tr>
<td>Z</td>
<td>0.100 Min.</td>
<td>2.54 Min.</td>
</tr>
<tr>
<td>AA</td>
<td>0.054 Min.</td>
<td>1.37 Min.</td>
</tr>
<tr>
<td>AB Dia.</td>
<td>0.85 Max.</td>
<td>21.6 Max.</td>
</tr>
</tbody>
</table>
Beam Power Tube

CERMOLOX
Broadband UHF Operation 2300 w CW Output at 890 MHz
Matrix Cathode Forced-Air Cooled

ELECTRICAL
Heater:

- Type: Matrix Oxide Coated Unipotential Cathode
- Voltage: 5.5 typ. V
- Current at 5.5 V: 31 A
- Instantaneous Starting Current: 90 max. A
- Minimum Heating Time: 180 s
- Mu-factor (Grid No.2 to Grid No.1): 14

MAXIMUM CCS RATINGS, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-250 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3 A</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>5000 W</td>
</tr>
</tbody>
</table>

MECHANICAL

- Operating Position: Any
- Weight (Approx.): 6 lb (2.7 kg)

THERMAL

- Seal Temperatures (Plate, Grid No.2, Grid No.1 Heater-Cathode, Heater): 250 max. °C
- Plate Core Temperature: 250 max. °C

*See Dimensional Outline for temperature measurement points.*

*Keep all stippled regions clear. Do not allow contacts or circuit components to intrude into these annular regions.*

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
DIMENSIONAL OUTLINE

RADIATOR

PLATE TERMINAL

GRID-No.2 TERMINAL

GRID-No.1 TERMINAL

HEATER-CATHODE TERMINAL CONTACT SURFACE

HEATER-TERMINAL

PLATE CORE TEMPERATURE MEASUREMENT POINT

REFERENCE LINE

SEE FOOTNOTE (b)

CERAMIC

• TEMPERATURE MEASUREMENT POINT

DIMENSIONAL OUTLINE

**NOTE:**

- See Footnote (b)
- Ceramic
- Temperature Measurement Point

92LM-2522V

### Table of Dimensions

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>4.57 Max.</td>
<td>116.1 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.250 ± .015</td>
<td>82.55 ± .38</td>
</tr>
<tr>
<td>C Dia.</td>
<td>3.028 ± .014</td>
<td>76.91 ± .35</td>
</tr>
<tr>
<td>D Dia.</td>
<td>2.319 ± .012</td>
<td>58.90 ± .30</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.850 ± .010</td>
<td>44.99 ± .25</td>
</tr>
<tr>
<td>F Dia.</td>
<td>0.725 Max.</td>
<td>18.42 Max.</td>
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<tr>
<td>G</td>
<td>4.70 Max.</td>
<td>119.4 Max.</td>
</tr>
<tr>
<td>H</td>
<td>4.140 ± .050</td>
<td>105.2 ± .12</td>
</tr>
<tr>
<td>J</td>
<td>1.620 ± .040</td>
<td>41.15 ± .10</td>
</tr>
<tr>
<td>K</td>
<td>1.330 ± .030</td>
<td>33.78 ± .76</td>
</tr>
<tr>
<td>M</td>
<td>0.200 ± .025</td>
<td>5.08 ± .63</td>
</tr>
<tr>
<td>N</td>
<td>0.475 ± .030</td>
<td>12.07 ± .76</td>
</tr>
<tr>
<td>P</td>
<td>1.945 ± .015</td>
<td>49.40 ± .38</td>
</tr>
</tbody>
</table>

RCA Electronic Components

DATA
Beam Power Tube

- CERMOLOX®
- Compact, Ruggedized
- Hard Tube Modulator
- 7000 Volts Peak
- 8.0 Amperes Peak
- Nanosecond Switching Time

General Data

Electrical:

Heater for Unipotential Cathode:

- Voltage (AC or DC) (typ.) = 6.0 V
- Voltage (AC or DC) (max.) = 6.4 V
- Current @ 6.0 volts = 7.6 A
- Minimum heating time = 120 s

Mu-Factor (Grid No.1 to grid No.2) = 6.6

Direct Interelectrode Capacitances:

- Grid No.1 to plate = 0.12 max. pF
- Grid No.1 to cathode = 30 pF
- Plate to cathode = 0.011 max. pF
- Grid No.1 to grid No.2 = 38 pF
- Grid No.2 to plate = 5.3 pF

Mechanical:

- Operating Position = Any
- Maximum Overall Length = (69.1 mm) 2.72 in
- Greatest Diameter = (45.3 mm) 1.77 in
- Temperature (All seals & plate core) = 250 max. °C
- Weight (Approx.) = (0.17 kg) 6 lb oz
- Terminal Connections = See Outline Drawing

Pulse Modulator Service

Maximum CCS Ratings, Absolute-Maximum Values:

- Instantaneous Peak Plate Voltage (Pulse duration 0.1 s) = 7000 max. V
- DC Plate Voltage = 5000 max. V
- DC Grid-No.2 Voltage = 1200 max. V
- DC Grid-No.1 Voltage = -250 max. V
- Peak Positive Grid-No.1 Voltage = 150 max. V
- Peak Plate Current = 8 max. A
- DC Plate Current = 0.500 max. A
Grid-No.2 Input (Average) ...................... 20 max. W
Grid-No.1 Input (Average) ...................... 8 max. W
Plate Dissipation (Average) ..................... 600 max. W.

Typical Operation:
With rectangular wave shape pulses, duty factor of 0.05 and pulse duration of 2 microseconds.

DC Plate Voltage ......................... 3000 V
Instantaneous Peak Plate Voltage ........ 7000 V
DC Grid-No.2 Voltage .................... 800 V
DC Grid-No.1 Voltage ..................... 120 V
Peak Positive Grid-No.1 Voltage ........ 25 V
Peak Plate Current ......................... 0.8 A
DC Plate Current ....................... 0.4 A
DC Grid-No.2 Current ...................... 0.012 A
DC Grid-No.1 Current ..................... 0.060 A
Load Resistance ......................... 225 Ω
Plate Dissipation (Average) ............... 480 W
Useful DC Power Output at Peak of Pulse .... 14,400 W

a See V.A.3 of 1CE-300. Heater voltage should be adjusted to the typical value initially, and then reduced to a lower value that will provide satisfactory performance. The life of the cathode can be conserved by adjusting to the lowest heater value that will give the desired performance.

b For plate voltage = 500 V, grid-No.2 voltage = 360 V, and plate current = 0.24 A.

c Measured with special shield adaptor.

d See Section VC of 1CE-300.

e An insulating fluid or pressurization may be required to prevent external tube arcing. The insulating fluid must be determined to be compatible with the tube for the particular application.

f The value of peak plate current shown applies to duty factors up to 0.05; for higher duty factors, the peak plate current must be reduced as shown in the Peak Plate Current Rating Chart.

See MGM Electronic Components DATA 1.
Note 1: Dimension "H" is maintained over the distance "M" with a finish of better than 32 microns.

Note 2: Ceramic.

Note 3: Keep all stippled regions clear.

*Dimensions are in inches unless otherwise stated. Metric equivalents in parentheses are given for information only and are based on 1 inch = 25.4 mm.

See next page for dimensions.
### Tabulated Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>0.660 ± .010</td>
<td>(16.76 ± .25)</td>
</tr>
<tr>
<td>B Dia.</td>
<td>1.000 ± .010</td>
<td>(25.40 ± .25)</td>
</tr>
<tr>
<td>C Dia.</td>
<td>1.300 ± .010</td>
<td>(33.02 ± .25)</td>
</tr>
<tr>
<td>D Dia.</td>
<td>1.600 ± .010</td>
<td>(40.64 ± .25)</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.755 ± .010</td>
<td>(44.58 ± .25)</td>
</tr>
<tr>
<td>F</td>
<td>0.020 Ref.</td>
<td>(0.51 Ref.)</td>
</tr>
<tr>
<td>G</td>
<td>1.150 Max.</td>
<td>(29.21 Max.)</td>
</tr>
<tr>
<td>H Radius</td>
<td>1.130 Max.</td>
<td>(28.70 Max.)</td>
</tr>
<tr>
<td>J Dia.</td>
<td>1.300 ± .002</td>
<td>(33.020 ± .051)</td>
</tr>
<tr>
<td>K Dia.</td>
<td>0.855 Max.</td>
<td>(21.72 Max.)</td>
</tr>
<tr>
<td>L Dia.</td>
<td>0.573 Max.</td>
<td>(14.55 Max.)</td>
</tr>
<tr>
<td>M</td>
<td>0.700 Min.</td>
<td>(17.78 Min.)</td>
</tr>
<tr>
<td>N</td>
<td>1.595 ± .035</td>
<td>(40.5 ± .9)</td>
</tr>
<tr>
<td>P</td>
<td>2.000 ± .045</td>
<td>(60.8 ± 1.1)</td>
</tr>
<tr>
<td>R</td>
<td>2.400 Ref.</td>
<td>(60.96 Ref.)</td>
</tr>
<tr>
<td>S</td>
<td>2.72 Max.</td>
<td>(69.1 Max.)</td>
</tr>
<tr>
<td>T</td>
<td>0.575 ± .025</td>
<td>(14.61 ± .64)</td>
</tr>
<tr>
<td>U</td>
<td>0.200 ± .020</td>
<td>(5.08 ± .51)</td>
</tr>
<tr>
<td>V</td>
<td>0.400 ± .020</td>
<td>(10.16 ± .51)</td>
</tr>
<tr>
<td>W</td>
<td>0.250 Ref.</td>
<td>(6.36 Ref.)</td>
</tr>
<tr>
<td>X</td>
<td>60° Ref.</td>
<td></td>
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<tr>
<td>Y</td>
<td>30° Ref.</td>
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<tr>
<td>Z</td>
<td>15° Ref.</td>
<td></td>
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</table>
Peak Plate Current Rating

- Peak Plate Current Rating

Pulse Duration - Microseconds

- Operating Region

Area Beyond Operating Region

Peak Plate Current - Amperes

92LM-2375

RCA Electronic Components

DATA 3

6-72
Beam Power Tube

CERMOLOX

High Gain RF Power Amplifier
Matrix Cathode
Forced-Air Cooled

2500 Watts Carrier Output at 400 MHz
10 kW PEP
16 dB Gain

ELECTRICAL
Heater:
Type .......................... Matrix-Type Oxide Coated
Unipotential Cathode
Voltage (ac or dc) .................. 22 ± 2 V
Current at 22 volts .................. 12.6 A
Minimum heating time ............. 180 s
Mu-Factor (Grid No.2 to Grid No.1) ........ 20

MAXIMUM CCS RATINGS, Absolute-Maximum Values:
Up to 500 MHz
DC Plate Voltage .................. 7000 V
DC Grid-No.2 Voltage ............. 1200 V
DC Plate Current .................. 2.0 A
Plate Dissipation .................. 10 kW

MECHANICAL
Operating Position .................. Any
Weight (Approx.) .................. 12 lb (5.4 kg)

THERMAL
Terminal Temperature (Plate, heater-cathode, and heater) ........ 250 max. °C
Grid No.2 and Grid No.1 ............. 200 max. °C
Plate-Core Temperature .................. 250 max. °C

See Dimensional Outline for temperature measurement points.

Keep all stippled regions clear. In general do not allow contacts to intrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
Beam Power Tube

Matrix-type Unipotential Cathode

Liquid Cooled 410 Watts PEP Output
UHF Grid-Drive Operation at 30 MHz
300 Watts UHF TV Output at 890 MHz
Distributed Amplifier Service to 500 MHz

ELECTRICAL

Heater, Unipotential Matrix Type:
Voltage (ac or dc) ......... 6.3 V
Current at 6.3 volts ....... 3.5 A
Minimum heating time .... 60 s
Mu-Factor, (grid No.2 to grid No.1) .... 12

MECHANICAL

Operating Position ............ Any
Weight (Approx.) .............. 8 oz (0.23 kg)

THERMAL

Terminal Temperature .......... 250 max. °C
Cathode-Heater Flange ......... 125 max. °C
Plate Seal Temperature ....... 250 max. °C
See Dimensional Outline for Temperature Measurement Points

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

DC Plate Voltage .............. 2200 V
DC Grid No.2 Voltage .......... 400 V
DC Grid No.1 Voltage .......... -100 V
DC Plate Current (Class A Service) .......... 600 mA
Plate Dissipation ............ 1000 W

* Keep all stippled regions clear. Do not allow contacts or circuit components to intrude upon these regions.

Detailed performance and application information is available through your RCA Sales Office Distributor, or by writing to RCA Commercial Engineering, Harrison, NJ 07029.
DIMENSIONAL OUTLINE (Front View)

COOLANT LINES
PLATE TERMINAL

ANODE CORE
TEMPERATURE
MEASURED HERE

CATHODE FLANGE
TEMPERATURE
MEASURED HERE

CATHODE HEATER
TERMINAL

MESH RING

CATHODE HEATER
CYLINDER TERMINAL

SEE FOOTNOTE (a)

DIMENSIONAL OUTLINE (Top View)

2 No. 6-32 STUDS

COOLANT OUTLET

COOLANT INLET

92LM-2512V

92LS-2517V
**DIMENSIONAL OUTLINE (Bottom View)**

![Diagram of the dimensional outline](image)

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.330 Max.</td>
<td>84.6 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>2.262 Max.</td>
<td>57.45 Max.</td>
</tr>
<tr>
<td>C</td>
<td>1.745 ± .025</td>
<td>44.32 ± .64</td>
</tr>
<tr>
<td>D</td>
<td>1.130 ± .010</td>
<td>28.70 ± .25</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.625 ± .015</td>
<td>4.128 ± .38</td>
</tr>
<tr>
<td>F</td>
<td>0.437 ± .010</td>
<td>1.11 ± .25</td>
</tr>
<tr>
<td>G</td>
<td>0.875 Min.</td>
<td>22.23 Min.</td>
</tr>
<tr>
<td>H</td>
<td>0.560 ± .020</td>
<td>14.22 ± .51</td>
</tr>
<tr>
<td>J</td>
<td>0.220 ± .020</td>
<td>5.59 ± .51</td>
</tr>
<tr>
<td>K Dia.</td>
<td>0.375 Nom.</td>
<td>9.53 Nom.</td>
</tr>
<tr>
<td>M Dia.</td>
<td>0.375 Nom.</td>
<td>9.53 Nom.</td>
</tr>
<tr>
<td>N</td>
<td>0.022 ± .002</td>
<td>0.56 ± .05</td>
</tr>
<tr>
<td>P</td>
<td>0.058 ± .008</td>
<td>1.47 ± .18</td>
</tr>
<tr>
<td>R Dia.</td>
<td>1.425 ± .010</td>
<td>36.20 ± .25</td>
</tr>
<tr>
<td>S</td>
<td>0.200 Max.</td>
<td>5.08 Max.</td>
</tr>
<tr>
<td>T Dia.</td>
<td>0.500 ± .010</td>
<td>12.70 ± .25</td>
</tr>
<tr>
<td>U Dia.</td>
<td>0.400 Min.</td>
<td>10.16 Min.</td>
</tr>
<tr>
<td>V</td>
<td>0.250 Min.</td>
<td>6.35 Min.</td>
</tr>
<tr>
<td>DIMENSION</td>
<td>INCHES</td>
<td>MILLIMETERS</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>W</td>
<td>0.425 Max.</td>
<td>10.80 Max.</td>
</tr>
<tr>
<td>X</td>
<td>0.337 + .018</td>
<td>8.66 + .46</td>
</tr>
<tr>
<td>Y</td>
<td>0.380 ± .020</td>
<td>9.66 ± .51</td>
</tr>
<tr>
<td>Z</td>
<td>0.060 Max.</td>
<td>1.12 Max.</td>
</tr>
<tr>
<td>AA Dia.</td>
<td>0.081 ± .002</td>
<td>2.06 ± .05</td>
</tr>
<tr>
<td>AB Dia.</td>
<td>0.081 ± .002</td>
<td>2.06 ± .05</td>
</tr>
<tr>
<td>AC Dia.</td>
<td>0.245 Min.</td>
<td>6.22 Min.</td>
</tr>
<tr>
<td>AD Dia.</td>
<td>2.000 ± .010</td>
<td>50.8 ± .25</td>
</tr>
<tr>
<td>AE Dia.</td>
<td>0.175 ± .005</td>
<td>4.45 ± .13</td>
</tr>
<tr>
<td>AF Dia.</td>
<td>0.126 ± .002</td>
<td>3.20 ± .05</td>
</tr>
<tr>
<td>AG</td>
<td>0.888 ± .017</td>
<td>22.05 ± .46</td>
</tr>
<tr>
<td>AH</td>
<td>45° ± 5'</td>
<td></td>
</tr>
<tr>
<td>AJ</td>
<td>90° ± 3°</td>
<td></td>
</tr>
<tr>
<td>AK</td>
<td>0.378 ± .003</td>
<td>9.60 ± .08</td>
</tr>
<tr>
<td>AM</td>
<td>0.171 ± .010</td>
<td>4.34 ± .25</td>
</tr>
<tr>
<td>AN</td>
<td>0.562 ± .010</td>
<td>14.27 ± .25</td>
</tr>
<tr>
<td>AP</td>
<td>0.950 ± .011</td>
<td>24.13 ± .28</td>
</tr>
</tbody>
</table>
Beam Power Tube

CERMOLOX
RF Power Amplifier and Oscillator to 1215 MHz
Matrix-Type Cathode
105 Watts CW Power Output at 1215 MHz
340 Watts CW Power Output at 400 MHz
Conduction Cooled

ELECTRICAL
Heater for Matrix-Type Oxide-Coated Unipotential Cathode:
Voltage (ac or dc) 6.3 V
Current at 6.3 volts 3.2 A
Minimum heating time 60 s
Mu-Factor, Grid No.2 to Grid No.1 18

MAXIMUM CCS RATINGs, Absolute-Maximum Values:
Up to 1215 MHz
DC Plate Voltage 2500 V
DC Grid-No.2 Voltage 400 V
DC Grid-No.1 Voltage -200 V
DC Plate Current 250 mA
Plate Dissipation 300 W

MECHANICAL
Operating Position Any
Weight (Approx.) 4 oz (0.1 kg)

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

See Dimensional Outline for Temperature Measurement Points.

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

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
### Dimensional Outline


#### Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.650 ± .090</td>
<td>67.31 ± 2.29</td>
</tr>
<tr>
<td>B Dia.</td>
<td>1.085 Min.</td>
<td>27.56 Min.</td>
</tr>
<tr>
<td>C Dia.</td>
<td>0.985 Min.</td>
<td>25.02 Min.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>0.735 Min.</td>
<td>18.67 Min.</td>
</tr>
<tr>
<td>E Dia.</td>
<td>0.260 Max.</td>
<td>6.60 Max.</td>
</tr>
<tr>
<td>F Dia.</td>
<td>0.480 Min.</td>
<td>12.19 Min.</td>
</tr>
<tr>
<td>G Dia.</td>
<td>0.990 ± .005</td>
<td>25.15 ± .13</td>
</tr>
<tr>
<td>H</td>
<td>1.355 Min.</td>
<td>34.42 Min.</td>
</tr>
<tr>
<td>J</td>
<td>0.165 Min.</td>
<td>4.19 Min.</td>
</tr>
<tr>
<td>K</td>
<td>0.800 Min.</td>
<td>15.24 Min.</td>
</tr>
<tr>
<td>M</td>
<td>1.230 ± .030</td>
<td>31.24 ± .78</td>
</tr>
</tbody>
</table>

#### Footnote (b)

See Footnote (b) for detailed notes on temperature measurement points.
Beam Power Tube

CERMOLOX
Ruggedized
Pulse Modulator

**Motrex Cathode**
13 kV, 20 Amperes
Conduction Cooled

**ELECTRICAL**

Heater:
- Type: Matrix Oxide-Coated Unipotential Cathode
- Voltage (ac or dc): \[5.5 \text{ typ. V}, 6.0 \text{ max. V}\]
- Current at 5.5 volts: 17.3 A
- Minimum heating time: 180 s
- Mu-Factor, Grid No.2 to Grid No.1: 17

**MAXIMUM RATINGS, Absolute-Maximum Values:**

- DC Plate Voltage: 13 kV
- Instantaneous Peak Plate Voltage: 20 kV (pulse duration < 0.1 s)
- DC Grid-No.2 Voltage: 1000 V
- DC Grid-No.1 Voltage: -300 V
- Peak Positive Pulse Grid-No.1 Voltage: 100 V
- Peak Plate Current: 30 A
- DC Plate Current: 1.5 A
- Plate Dissipation (Average): 1.5 kW

**MECHANICAL**

- Operating Position: Any
- Weight (Approx.): 2 lb (0.91 kg)

**THERMAL**

- Terminal Temperature (Plate, grid No.2 grid No.1, cathode and heater): 250 max. °C
- Plate-Seal Temperature: 250 max. °C

- See *Dimensional Outline* for temperature measurement points.
- Keep all stippled clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
### DIMENSIONAL OUTLINE

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.31 Max.</td>
<td>84.1 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.020 ± .010</td>
<td>76.71 ± .25</td>
</tr>
<tr>
<td>C Dia.</td>
<td>2.317 ± .010</td>
<td>58.85 ± .25</td>
</tr>
<tr>
<td>D Dia.</td>
<td>1.717 ± .007</td>
<td>43.61 ± .18</td>
</tr>
<tr>
<td>E Dia.</td>
<td>0.713 ± .012</td>
<td>18.11 ± .30</td>
</tr>
<tr>
<td>F Dia.</td>
<td>2.286 ± .001</td>
<td>57.56 ± .03</td>
</tr>
<tr>
<td>G</td>
<td>0.725 Min.</td>
<td>18.42 Min.</td>
</tr>
<tr>
<td>H</td>
<td>2.780 ± .040</td>
<td>70.61 ± 1.02</td>
</tr>
<tr>
<td>J</td>
<td>2.185 ± .030</td>
<td>55.50 ± .76</td>
</tr>
<tr>
<td>K</td>
<td>0.200 ± .025</td>
<td>5.08 ± .64</td>
</tr>
<tr>
<td>M</td>
<td>0.370 ± .030</td>
<td>9.40 ± .76</td>
</tr>
<tr>
<td>N</td>
<td>0.460 ± .030</td>
<td>11.68 ± .76</td>
</tr>
<tr>
<td>P Dia.</td>
<td>0.755 ± .010</td>
<td>19.18 ± .25</td>
</tr>
</tbody>
</table>

SEE Footnote (b)

CERAMIC

TEMPERATURE MEASUREMENT POINT

92LM-2509V
RF Power Amplifier Tetrodes

- CW Output up to 250 kW (4647), 500 kW (4648)
- Pulsed Output up to: 500 kW peak (4647) 1000 kW peak (4648)
- Full Input to 1000 MHz (Each Type)
- Power Gain up to 28 dB (Each Type)

General Data
Electrical:

<table>
<thead>
<tr>
<th>Type</th>
<th>4647</th>
<th>4648</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament</td>
<td>Multistrand Thoriated Tungsten</td>
<td></td>
</tr>
<tr>
<td>Current, dc operating,</td>
<td>Typ. 840 A</td>
<td>1600 A</td>
</tr>
<tr>
<td></td>
<td>Max. 860 A</td>
<td>1640 A</td>
</tr>
<tr>
<td>Starting Current (Must never exceed even momentarily)</td>
<td>Max. 1000 A</td>
<td>2000 A</td>
</tr>
<tr>
<td>Voltage at 840 A</td>
<td>Typ. 3.7 V</td>
<td>3.7 V</td>
</tr>
<tr>
<td>Minimum Heating Time to Reach Operating Voltage</td>
<td>60 s</td>
<td></td>
</tr>
<tr>
<td>Minimum Heating Time at Operating Voltage Before Applying Plate Voltage</td>
<td>60 s</td>
<td></td>
</tr>
<tr>
<td>Mu-Factor (grid No.2 to grid No.1)</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

Direct Interelectrode Capacitances:

- Grid No.1 to plate | 0.3 pF | 0.6 pF
- Grid No.1 to grid No.2 and cathode | 680 pF | 1200 pF
- Plate to cathode and grid No.2 | 85 pF | 85 pF
- Grid No.2 to cathode | 130 pF | 140 pF
- Grid No.2 to grid No.1 | 425 pF | 775 pF
- Grid No.1 to cathode | 255 pF | 425 pF

Mechanical (Each Type)

- Operating Attitude | Tube axis vertical, either end up
- Overall Length, Maximum | (470 mm) 18.5 in
- Maximum Diameter | (296 mm) 11.65 in
- Terminal Connections | See Dimensional Outline
- Weight (approx.) Uncrated | (34.0 kg) 75 lb
| Crated | (122.5 kg) 270 lb

Thermal (Each Type)

- Maximum Ceramic-Insulator Temperature | 150 °C
- Maximum Metal-Surface Temperature | 100 °C

Electronic Components

DATA 1 10/71
Cooling:

It is important that the temperature of the individual parts of the tube not exceed the value specified.

Air Cooling

In general, forced-air cooling of the ceramic insulators and the adjacent contact areas may be required if the tube is used in a confined space without free circulation of air. Under such conditions, provision should be made for blowing an adequate quantity of air across the ceramic insulators and adjacent terminal areas to limit their maximum temperature to the value specified. Interlocking of the air flow with all power supplies is recommended to prevent tube damage in case of failure of adequate air flow.

Liquid Cooling:

Liquid cooling of the filament, filament ground, grid No.1, grid No.2, and plate is required. When the environmental temperature permits, the coolant may be water; the use of distilled water or filtered deionized water is essential. The liquid flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the liquid flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate liquid flow.

Pulsed RF Amplifier

For frequencies up to 100 MHz and a maximum "ON" time of 2500 µs in any 40,000-microsecond interval

Maximum Ratings, Absolute-Maximum Values:
<table>
<thead>
<tr>
<th>DC Grid-No.2 Current</th>
<th>120</th>
<th>250</th>
<th>max. mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.1 Current</td>
<td>150</td>
<td>310</td>
<td>max. mA</td>
</tr>
</tbody>
</table>

**Plate Dissipation**

(Average) 20 40 max. kW

**Typical Plate-Pulsed Operation:**

In Class B service at 425 kHz with a rectangular waveshape pulse at a duty factor of 0.06 and a pulse duration of 2000 microseconds.

<table>
<thead>
<tr>
<th>Peak Positive-Pulse Plate Voltage</th>
<th>30</th>
<th>30</th>
<th>kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Grid-No.2 Voltage</td>
<td>1400</td>
<td>1400</td>
<td>V</td>
</tr>
<tr>
<td>Peak Negative-Pulse Grid-No.1 Voltage</td>
<td>225</td>
<td>225</td>
<td>V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>25</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>Peak Grid-No.2 Current</td>
<td>1.3</td>
<td>2.5</td>
<td>A</td>
</tr>
<tr>
<td>Peak Rectified Grid-No.1 Current</td>
<td>2.5</td>
<td>5.0</td>
<td>A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.5</td>
<td>3.0</td>
<td>A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>80</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>150</td>
<td>300</td>
<td>mA</td>
</tr>
<tr>
<td>Peak Driver Power Output (approx.)</td>
<td>750</td>
<td>1500</td>
<td>W</td>
</tr>
<tr>
<td>Output Circuit Efficiency (approx.)</td>
<td>95</td>
<td>95</td>
<td>%</td>
</tr>
<tr>
<td>Useful Peak Power Output</td>
<td>500</td>
<td>1000</td>
<td>kW</td>
</tr>
</tbody>
</table>

**RF Power Amplifier** — Class C Telegraphy and RF Power Amplifier — Class C FM Telephony

**Maximum CCS Ratings, Absolute-Maximum Values:** Up to 100 MHz

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>22</th>
<th>22</th>
<th>max. kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1400</td>
<td>1400</td>
<td>max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-400</td>
<td>-400</td>
<td>max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>23</td>
<td>45</td>
<td>max. A</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>125</td>
<td>250</td>
<td>max. kW</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>1.8</td>
<td>3.5</td>
<td>max. kW</td>
</tr>
<tr>
<td>Grid-No.1 Dissipation</td>
<td>1.5</td>
<td>3.0</td>
<td>max. kW</td>
</tr>
</tbody>
</table>

**Typical CCS Operation:**

At 425 kHz

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>20</th>
<th>20</th>
<th>kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200</td>
<td>1200</td>
<td>V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-225</td>
<td>-225</td>
<td>V</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>285</td>
<td>285</td>
<td>V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>19</td>
<td>38</td>
<td>A</td>
</tr>
</tbody>
</table>
### Plate-Modulated RF Power Amplifier — Class C Telephony

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

#### Maximum CCS Ratings, Absolute-Maximum Values: Up to 100 MHz

<table>
<thead>
<tr>
<th>Tube</th>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>Plate Dissipation</th>
<th>Grid-No.2 Dissipation</th>
<th>Grid-No.1 Dissipation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4647</td>
<td>16</td>
<td>1100</td>
<td>-400</td>
<td>13</td>
<td>75</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>4648</td>
<td>16 max. kV</td>
<td>1100 max. V</td>
<td>400 max. V</td>
<td>25 max. A</td>
<td>150 max. kW</td>
<td>2.5 max. kW</td>
<td>2.5 max. kW</td>
</tr>
</tbody>
</table>

#### Typical Operation

At 425 kHz

<table>
<thead>
<tr>
<th>Tube</th>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>Peak RF Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
<th>Driver Power Output (approx.)</th>
<th>Output-Circuit Efficiency (approx.)</th>
<th>Useful Power Output (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4647</td>
<td>14</td>
<td>1000</td>
<td>-250</td>
<td>280</td>
<td>11</td>
<td>700</td>
<td>1.3</td>
<td>376</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>4648</td>
<td>14 kV</td>
<td>1000 V</td>
<td>-250 V</td>
<td>280 V</td>
<td>22</td>
<td>1,3</td>
<td>2.5</td>
<td>750 W</td>
<td>95</td>
<td>200 kW</td>
</tr>
</tbody>
</table>

---

a The filament, when operated near its maximum current is capable of providing emission in excess of service requirements for which the tube is rated. To extend the filament life, it is recommended that the filament current be reduced to a value that will give adequate but not excessive emission. For accurate measurement it is...
essential that the filament voltage be measured at the respective coolant terminals on the tube side of the coupling thread.

b The tube coolant ducts must be free of water before storage or shipment of the tube to prevent damage from freezing.

c The external gas pressure is related to the output cavity pressurization required to prevent corona or external arc-over.

d For additional information on liquid cooling see Section IV of the “Application Guide for RCA Power Tubes” 1CE-279A.

e Measured directly across cooled element for the indicated typical flow.

f See RCA Transmitting Tube Operating Considerations, CLASSES OF SERVICE given at front of this section.

g Refer to 1CE-279A for definitions.

h The magnitude of any spike on the plate voltage pulse should not exceed the peak value of the plate voltage pulse 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 circuit may require pressurization to prevent corona or external arc-over at the ceramic insulator.

i The magnitude of any spike on the grid-No.2 voltage pulse should not exceed the peak value of the grid-No.2 voltage pulse 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.

j A negative dc voltage of 300 volts maximum may be applied to grid No.2 to prevent any tube conduction between pulses.

k Determined by calorimeter measurements. Power specified includes intercepted power radiated from the filaments.

l The grid-No.1 voltage may be a combination of fixed and self bias obtained from a series grid resistor.

m Handling (Each Type)
General information for handling RCA large power tubes is given in Section II-D of RCA’s “Application Guide for RCA Power Tubes”, 1CE-279A. During shipment the tube is suspended by springs in a crate. An AJ2195 Lifting Adaptor, featuring a 1.0-inch I.D. eyebolt, must be attached to the tube before removing it from the shipping crate. The
use of a hoist capable of lifting a weight of 100 lbs is recommended for the uncrating operation.

Uncrating Instructions (Each Type)
The following is the recommended procedure for removing this tube from its shipping crate.

1. Cut the two metal bands which close the crate. Remove the two "ball" seals. Disengage the two hasps and remove the crate lid.

2. Open the two drop flaps on the sides of the crate.

3. Cut the wires threaded through the four wing nuts that secure the wooden mounting plate for the tube to the spring supported frame. Unscrew and remove the wing nuts and washers. Save the wing nuts and washers for Step 8.

4. Cut open the top of plastic bag enclosing the tube. Attach the AJ2195 Lifting Adaptor to the ground surface ring surrounding the grid-No.1 terminal using four 10-32 bolts.

5. Connect a hoist to the eyebolt of the lifting fixture. Raise the tube and wooden mounting plate from the crate.

6. Remove the wooden mounting plate from the tube by cutting and removing the safety wire and then unscrewing the four cap screws. Do not drop the wooden mounting plate.

7. Remove the plastic bag from the tube.

8. Reattach the wooden mounting plate to the spring supported frame using the washers and wing nuts from Step 3. Replace the crate lid. Retain the crate for future tube shipment or storage.

Tube Mounting (Each Type)
It is recommended that the tube be mounted with the axis vertical and either end up. In either case, support the weight of the tube on or by the indicated mounting surface shown on the tube outline drawing. Eight equally spaced 1/4-28 tapped holes on a 9.25-inch (23.5 mm) dia. bolt circle are provided in this surface for securing the tube in place.
If the tube is to be mounted with the input end up, the tube may be placed directly into the operating position with the hoist setup of Step 7 of the Uncrating Instructions. After mounting, the AJ2195 Lifting Adaptor should be removed from the tube and stored for future use.

If the tube is to be mounted with the output end up special care must be taken when turning it around. The recommended procedure is as follows:

1. Lift tube using the Lifting Adaptor AJ2195.
2. Attach a 15-inch diameter mounting plate to the tube mounting surface. This plate shall have two eye-bolts 180° apart in a horizontal plane. Use all eight mounting holes. See accompanying Mounting Plate and Lifting Recommendation.
3. Set tube down resting on mounting plate.
4. Remove the Lifting Adaptor AJ2195.
5. Lift tube using the eye-bolts on the mounting plate. It is important that the tube be held steady while being raised.
6. Carefully turn tube end for end.
7. Set tube down on stand so that it will be suspended from the mounting plate.

Cooling Considerations (Each Type)
Consult Section IV of 1CE-279A for general recommendations on liquid cooling.

The weight of the coolant hoses must be externally supported to insure against applying excessive mechanical stress to the tube.

Anode Coolant Separator (Each Type)
The AJ2196 Plate Coolant Separator was designed as an accessory for this tube and must be ordered as a separate item. Unless ordered, the tube will be delivered without a
water separator. The coolant separator shall be installed in accordance with the following procedure.

1. Visually inspect the coolant separator and tube anode water cavity to assure that they are clean and free of particles. Caution: Do not clean the anode coolant fins mechanically.

2. Place a clean, lubricant-free "O" ring (uniform size No. 237) in the moat on the anode flange.

3. Carefully insert the AJ2196 Plate Coolant Separator into the anode cavity so as not to damage the anode coolant fins along the side of the anode cavity. Note: No force is required to insert the separator. After the coolant separator has been completely inserted rotate it, if necessary, to line up the clearance holes in the separator with the tapped holes in the anode flange.

4. Secure the separator in place with eight 1/4-20 NC x 5/8-inch long stainless steel, binding-head screws.

Coolant Course Inspection (Each Type)
Please consult Section IV-D of 1CE-279A for instructions on "Inspection of Coolant Courses" and Section IV-E for instructions on "Cleaning Coolant Courses." Attention is directed especially to the anode coolant fins which are soft and easily damaged. Do not attempt to clean these fins by mechanical methods.

Electrical Considerations (Each Type)
Please consult 1CE-279A. Attention is directed to Section III-B for the design of electrical connections and to Section VI for general electrical considerations.

Electrical requirements unique to this tube include the following items:

A. Filament
A dc filament supply is required. Filament excitation with an ac supply may generate mechanical resonances in the cathode structure.

The dc electrical filament connections must be made as
follows: the positive lead is connected to the filament terminal and coolant connection on the input end of the tube using the AJ2198 connector. The negative lead is connected to the dc filament ground terminal on the output end of the tube using all eight 1/4-28 tapped holes.

B. RF Driver

The value of drive power given under typical operation represents the approximate drive power required at the specified operating frequency. The driver stage should be designed to provide an excess of power over that indicated to take care of variations in line voltage and initial tube characteristics, changes in components, and tube characteristics during life, and transmission line mismatches.

The input impedance of this tube may vary over a considerable range. The exact range is a function of the grid bias and input rf voltage swing. In instances where the input rf voltage swing exceeds the bias level, the input impedance of the tube will decrease considerably. This change in input drive impedance may limit the input drive voltage unless the circuit designer utilizes a low impedance bias supply and driver circuit. The RF input circuit should be connected between the RF-Grid-No.1 terminal and the RF Input Cathode Terminal. Caution: The RF Input Cathode terminal is at filament potential and must never be connected directly to the Grid-No.1 terminal or ground. For drive circuit recommendations, please consult your RCA representative or RCA Large Power Tube Application Engineering, Lancaster, PA 17604.

C. Control Grid and Screen Grid

Due to power radiation from the filament and secondary electron emission, the control and screen grid power dissipation will be higher than that indicated by the voltage-current product for each grid. The actual dissipations must be measured calorimetrically by measuring the electrode inlet and outlet water temperatures and the
coolant flow. For temperatures measured in °C and for water flow in GPM, the dissipation may be calculated using the equation:

\[
\text{Power Dissipation in kW} = 0.264 \times \text{(GPM)} \times (T_{\text{out}} - T_{\text{in}})
\]

**X-Radiation Warning**

X-radiation may be produced when operating this tube. For each installation, the X-radiation must be checked and shields provided if the radiation level exceeds safe limits.

**Protection Circuitry (Each Type)**

Protection circuits serve a three-fold purpose; safety of personnel; protection for the tube in the event of abnormal circuit operation; and protection of the tube circuits in the event of abnormal tube operation.

Large power tubes require protective devices to insure against high voltage shocks, rf radiation, loss of coolant flow, inadequate warm-up, etc. A full treatment of protective requirements is covered in Section VI.B of the "Application Guide for RCA Power Tubes" 1CE-279.

**Filament, Grid No. 1 and Grid No. 2 (Type 4647)**

**Flow and Pressure Drop Characteristics for Water**

<table>
<thead>
<tr>
<th>Coolant Course</th>
<th>Flow</th>
<th>Max. Press. Diff. for typ. flow&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abs. min.</td>
<td>TYP. flow</td>
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<tr>
<td></td>
<td>gpm</td>
<td>cc/s</td>
</tr>
<tr>
<td>Filament</td>
<td>1.5</td>
<td>95</td>
</tr>
<tr>
<td>Filament Ground</td>
<td>1.5</td>
<td>95</td>
</tr>
<tr>
<td>Grid No.1</td>
<td>1.5</td>
<td>95</td>
</tr>
<tr>
<td>Grid No.2</td>
<td>1.5</td>
<td>95</td>
</tr>
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</table>
Filament, Grid No. 1 and Grid No. 2 (Type 4648)
Flow and Pressure Drop Characteristics for Water

<table>
<thead>
<tr>
<th>Coolant Course</th>
<th>Flow</th>
<th>Max. Press. Diff. for typ. flow&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abs.</td>
<td>Typ. flow</td>
</tr>
<tr>
<td></td>
<td>gpm</td>
<td>cc/s</td>
</tr>
<tr>
<td>Filament</td>
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<td>126</td>
</tr>
<tr>
<td>Filament Ground</td>
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<td>126</td>
</tr>
<tr>
<td>Grid No.1</td>
<td>2.0</td>
<td>126</td>
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<tr>
<td>Grid No.2</td>
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MOUNTING PLATE AND LIFTING RECOMMENDATION
(Each Type)

Basic dimensions in inches. Parenthetical dimensions in mm for reference.
Tabulated Dimensions*

<table>
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<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>0.88 Min.</td>
<td>22.3 Min.</td>
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<tr>
<td>B</td>
<td>5.0 Max.</td>
<td>127 Max.</td>
</tr>
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</table>

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm)
PLATE COOLANT SEPARATOR AJ2196 (Each Type)

[Diagram of plate coolant separator]

Tabulated Dimensions*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10.95 Max.</td>
<td>278.1 Max.</td>
</tr>
<tr>
<td>B</td>
<td>0.35 ± .02</td>
<td>8.89 ± .51</td>
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<tr>
<td>C Dia.</td>
<td>5.20 ± .01</td>
<td>32.08 ± .25</td>
</tr>
<tr>
<td>D</td>
<td>5.5 Max.</td>
<td>139 Max.</td>
</tr>
<tr>
<td>E</td>
<td>2.60 ± .20</td>
<td>66.1 ± 5.1</td>
</tr>
</tbody>
</table>

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm).
COOLANT CONNECTOR AJ2197 (Each Type)

THREADED FOR 1-1/4" 16 UN CLASS 2B

KNURLED SLEEVE

SECTION AA'

Tabulated Dimensions*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>B Dia.</td>
<td>1.50</td>
<td>38.1</td>
</tr>
<tr>
<td>C Dia.</td>
<td>1.15</td>
<td>29.2</td>
</tr>
<tr>
<td>D</td>
<td>0.38</td>
<td>9.6</td>
</tr>
<tr>
<td>E</td>
<td>0.12</td>
<td>3.0</td>
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<tr>
<td>F</td>
<td>0.69</td>
<td>17.5</td>
</tr>
<tr>
<td>G</td>
<td>3.32 Min.</td>
<td>84.3 Min.</td>
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</table>

Note 1— "O" Ring Moat has an OD of 0.485" (12.32 mm) and a depth of 0.05" (1.3 mm)

*Basic dimensions are in inches. Metric dimensions are derived from the basic inch dimension (1 inch = 25.4 mm).
FILAMENT ELECTRICAL AND COOLANT CONNECTOR AJ2198
(Each Type)

Tabulated Dimensions*

<table>
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<th>Millimeters</th>
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<td>95.3</td>
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<td>B</td>
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<td>31.7</td>
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<tr>
<td>C</td>
<td>0.39</td>
<td>9.9</td>
</tr>
<tr>
<td>D</td>
<td>0.62</td>
<td>15.7</td>
</tr>
<tr>
<td>E</td>
<td>2.37</td>
<td>60.2</td>
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<tr>
<td>F</td>
<td>0.53</td>
<td>13.5</td>
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<tr>
<td>G</td>
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<td>38.1</td>
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<tr>
<td>H</td>
<td>1.15</td>
<td>29.2</td>
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<tr>
<td>J</td>
<td>0.12</td>
<td>3.0</td>
</tr>
<tr>
<td>K</td>
<td>0.38</td>
<td>9.6</td>
</tr>
<tr>
<td>L</td>
<td>0.69</td>
<td>17.5</td>
</tr>
<tr>
<td>M</td>
<td>0.69</td>
<td>17.5</td>
</tr>
<tr>
<td>N</td>
<td>0.25</td>
<td>6.4</td>
</tr>
<tr>
<td>P</td>
<td>2.62 Min.</td>
<td>66.7 Min.</td>
</tr>
</tbody>
</table>

Note 1— Moat for "O" ring has an OD of 0.485 inch (12.3 mm) and a depth of 0.05 inch (1.3 mm).
DIMENSIONAL OUTLINE (Each Type)

EXHAUST COVER
MAKE NO CONNECTION
DO NOT REMOVE

GROUND SURFACE
(NOTE 11)

GETTER COVER
MAKE NO CONNECTION

(4) HOLES (NOTE 7)

DC GRID No.1 TERMINAL & COOLANT CONNECTION
(NOTES 1 & 2)

FILAMENT
GROUND
COOLANT
CONNECTION
(NOTES 1, 2 & 10)

FILAMENT TERMINAL & COOLANT CONNECTION
(NOTES 1 & 3)

RF GRID No.1 TERMINAL
SEE DETAIL

AJ2196 LIFTING ADAPTOR

RF INPUT CATHODE TERMINAL (NOTE 4)
SEE DETAIL

RF GRID No.2 TERMINAL
RF AND DC PLATE TERMINAL

AJ2196 PLATE COOLANT SEPARATOR

Electronic Components

DATA 8
DIMENSIONAL OUTLINE (Bottom View)

- RF OUTPUT GROUND TERMINAL, DC FILAMENT GROUND TERMINAL AND TUBE MOUNTING SURFACE (NOTE 9)
- (8) HOLES (NOTE 8)
- (8) HOLES (NOTE 8)

DETAIL OF RF INPUT CATHODE AND RF GRID NO. 1 TERMINAL, CONTACT SURFACES AND DC GRID NO. 1 TERMINAL

- DC GRID No. 1 (NOTES 1 & 2)
- RF INPUT CATHODE (NOTE 4)
- GROUND SURFACE (NOTE 11)
- TERMINAL SURFACE

DATA 9
10-71
**Notes for Dimensional Outline**

1. Terminal is 1-1/4" dia. threaded 0.5" (12.7 mm) long with 16 UN class 2A thread. It has two holes 0.312" 0.324" (7.92–8.23 mm) diameter spaced 0.531" (13.49 mm) on centers.

2. Terminal will accept coolant connector AJ2197.

3. Terminal will accept filament electrical and coolant connector AJ2198.

4. The RF Input Cathode Terminal is at filament potential. Do not ground.

5. This diameter dimension is held only over length of V.

6. Eight (8) holes tapped 1/4"-20 NC equally spaced on a 4.20" (106.7 mm) diameter bolt circle.

7. Four (4) holes tapped 10-32 NF to a minimum depth of .20" (5.1 mm) equally spaced on a 4.20" ± .03" (106.68 ± .76 mm) diameter bolt circle.

8. Eight (8) holes, tapped 1/4"-28 NF to a minimum depth of
.30" (7.6 mm) equally spaced on a 9.25" ± .03" (234.95 ± .76 mm) diameter bolt circle.

9. Contact should not be made at a diameter smaller than 6.30" (160.0 mm) nor greater than 10.90" (276.9 mm).

10. Make no electrical connections.

11. Ground surface is used to attach Lifting Adaptor AJ2195 and may be used during operation to support input circuit components at ground potential.

Tabulated Dimensions for Dimensional Outline

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>26.0 max.</td>
<td>660 max.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>18.5 max.</td>
<td>470 max.</td>
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<tr>
<td>C</td>
<td>4.84 ± .02</td>
<td>122.94 ± .51</td>
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</tr>
<tr>
<td>D Dia.</td>
<td>11.65 max.</td>
<td>295.9 max.</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1.07 ± .03</td>
<td>27.18 ± .76</td>
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</tr>
<tr>
<td>F</td>
<td>0.52 ± .01</td>
<td>13.21 ± .25</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>0.42 ± .01</td>
<td>10.67 ± .25</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>8.35 ± .10</td>
<td>212.1 ± 2.5</td>
<td></td>
</tr>
<tr>
<td>J Dia.</td>
<td>5.50 ± .01</td>
<td>139.70 ± .25</td>
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<tr>
<td>K Dia.</td>
<td>5.12 ± .10</td>
<td>130.0 ± 2.5</td>
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</tr>
<tr>
<td>L Dia.</td>
<td>5.25 ± .01</td>
<td>133.35 ± .25</td>
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<tr>
<td>M Dia.</td>
<td>9.10 ± .08</td>
<td>231.1 ± 2.0</td>
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<tr>
<td>N</td>
<td>—</td>
<td>—</td>
<td>72° ± 3°</td>
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<tr>
<td>P Dia.</td>
<td>6.30 max.</td>
<td>160.0 max.</td>
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<tr>
<td>Q Dia.</td>
<td>10.90 min.</td>
<td>276.9 min.</td>
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<tr>
<td>R Dia.</td>
<td>3.30 max.</td>
<td>83.9 max.</td>
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<tr>
<td>S Dia.</td>
<td>2.319 ± .012</td>
<td>58.90 ± .30</td>
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<tr>
<td>T Dia.</td>
<td>1.725 ± .015</td>
<td>43.82 ± .38</td>
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<tr>
<td>U</td>
<td>4.50 ± .02</td>
<td>114.30 ± .51</td>
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<tr>
<td>V</td>
<td>0.24 min.</td>
<td>6.1 min.</td>
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<tr>
<td>W</td>
<td>1.47 ± .06</td>
<td>37.3 ± 1.5</td>
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<tr>
<td>X</td>
<td>0.63 ± .06</td>
<td>16.00 ± 1.52</td>
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<tr>
<td>Y</td>
<td>0.46 ± .06</td>
<td>11.68 ± 1.52</td>
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<tr>
<td>Z</td>
<td>0.22 ± .02</td>
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<tr>
<td>AA</td>
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<td>AC</td>
<td>0.25 ± .02</td>
<td>6.35 ± .51</td>
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<tr>
<td>AD Dia.</td>
<td>1.62 ± .02</td>
<td>41.15 ± .51</td>
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<td>AE Dia.</td>
<td>1.74 ± .02</td>
<td>44.20 ± .51</td>
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<td>AF</td>
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<td>15.7 ± 2.5</td>
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<td>AG</td>
<td>0.75 ± .05</td>
<td>19.0 ± 1.3</td>
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<tr>
<td>AH</td>
<td>0.45 max.</td>
<td>11.4 max.</td>
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720° ± 5°

RCA
Electronic Components

DATA 10
10-71
COOLING CHARACTERISTICS (Type 4647)

- MAXIMUM PRESSURE DIFFERENTIAL FOR TYPICAL FLOW - psi
- MAXIMUM PRESSURE DIFFERENTIAL FOR TYPICAL FLOW - kg/cm²
- ABSOLUTE MINIMUM FLOW
- TYPICAL FLOW
- MAXIMUM PRESSURE DIFFERENTIAL

WATER FLOW - gpm
AVERAGE PLATE DISSIPATION - KILOWATTS

<table>
<thead>
<tr>
<th>WATER FLOW</th>
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<th>AVERAGE PLATE DISSIPATION - KILOWATTS</th>
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RCA Electronic Components
TYPICAL PLATE CHARACTERISTICS ($E_{c2} = 1400$ V)
(Type 4647)

FILAMENT CURRENT $I_f = 840$ A
GRID No.2 VOLTAGE $E_{c2} = 1400$ V
PLATE CURRENT

PLATE VOLTAGE – KILOVOLTS
PLATE CURRENT – AMPERES
TYPICAL PLATE CHARACTERISTICS ($E_{c2} = 1400$ V)
(Type 4648)

FILAMENT CURRENT ($I_f = 1600$ A)
GRID No.2 VOLTAGE ($E_{c2} = 1400$ V)
PLATE CURRENT

PLATE VOLTAGE - KILOVOLTS

RCA Electronic Components
TYPICAL CHARACTERISTICS ($E_{c2} = 1400$ V)
(Type 4647)

FILAMENT CURRENT $I_f = 540$
GRID No. 2 VOLTAGE $E_{c2} = 1400$
GRID No. 1 CURRENT $I_c$
GRID No. 2 CURRENT $I_{c2}$

PLATE VOLTAGE - KILOVOLTS

RCA Electronic Components
TYPICAL CHARACTERISTICS ($E_{c2} = 1400$ V)
(Type 4748)

FILAMENT CURRENT $I_f = 1600$ A
GRID No.2 VOLTAGE $E_{c2} = 1400$ V
GRID No.1 CURRENT
GRID No.2 CURRENT

PLATE VOLTAGE - KILOVOLTS

Electronic Components

DATA 13
10-71
TYPICAL PLATE CHARACTERISTIC \( E_{c2} = 1000 \text{ V} \)
(Type 4647)
TYPICAL PLATE CHARACTERISTIC ($E_{c2} = 1000$ V)
(Type 4648)

- FILAMENT CURRENT $I_f = 1600$ A
- GRID No.2 VOLTAGE $E_{c2} = 1000$ V
- PLATE CURRENT

**Diagram:**
- Plate Voltage vs. Plate Current graph.
- Grid No.2 Voltage and Plate Voltage indicated.
- Filament Current specified.

**Electronic Components**

RCA

DATA 14
10-71
TYPICAL CHARACTERISTICS ($E_{c2} = 1000$ V)  
(Type 4647)

**FILAMENT CURRENT** $I_f = 840$ A

**GRID No.2 VOLTAGE** $E_{c2} = 1000$ V

**GRID No.1 CURRENT**

**GRID No.2 CURRENT**

**PLATE VOLTAGE** - KILOVOLTS

---

**MCEDO**

Electronic Components

DATA 14
Beam Power Tube

CERMOLOX

Ruggedized

Full Input to 400 MHz

1000 Watts PEP Output

Matrix Cathode

37 dB Open-Loop Third Order Distortion

ELECTRICAL

Heater-Cathode:

Type .................................. Unipotential, Oxide Coated, Matrix

Voltage (ac or dc) ................... 5.5 typ.-5.8 max. V

Current at 5.5 V ..................... 17.3 max. A

Surge Current (RMS) ................. 50 max. A

(Under any conditions)

Minimum Heating Time ................. 180 s

Mu Factor (Grid No.1 to Grid No.2) ...... 7

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

Up to 400 MHz

DC Plate Voltage ...................... 3500 max. V

DC Grid-No.2 Voltage ................. 1000 max. V

DC Plate Current at Peak of Envelope .... 1.25 max. A

Grid-No.2 Input ....................... 50 max. W

Plate Dissipation ..................... 1.5 max. kW

MECHANICAL

Operating Position .................. Any

Weight (Approx.) ..................... 2 lb (0.9 kg)

THERMAL

Seal Temperature ..................... 250 max. °C

(Plate, Grid No.1, Grid No.2
Cathode-Heater, and Heater)

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

See Dimensional Outline for temperature measurement points.

Keep all stripped regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
### DIMENSIONAL OUTLINE

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>3.72  ± .03</td>
<td>94.49 ± .76</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.210 Min.</td>
<td>81.54 Min.</td>
</tr>
<tr>
<td>C Dia.</td>
<td>3.010 Min.</td>
<td>76.45 Min.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>2.307 Min.</td>
<td>58.60 Min.</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.710 Min.</td>
<td>43.41 Min.</td>
</tr>
<tr>
<td>F Dia.</td>
<td>0.725 Max.</td>
<td>18.41 Max.</td>
</tr>
<tr>
<td>G</td>
<td>3.24 ± .10</td>
<td>82.3 ± 2.5</td>
</tr>
<tr>
<td>H</td>
<td>2.78 ± .07</td>
<td>70.61 ± 1.78</td>
</tr>
<tr>
<td>J</td>
<td>2.19 ± .04</td>
<td>55.63 ± 1.02</td>
</tr>
<tr>
<td>K</td>
<td>0.85 Min.</td>
<td>21.59 Min.</td>
</tr>
<tr>
<td></td>
<td>+ .005</td>
<td>+ .127</td>
</tr>
<tr>
<td>M</td>
<td>1.160 ± .000</td>
<td>29.464 ± .000</td>
</tr>
<tr>
<td>N</td>
<td>0.82 ± .03</td>
<td>20.83 ± .76</td>
</tr>
<tr>
<td>P</td>
<td>0.200 ± .025</td>
<td>5.08 ± .63</td>
</tr>
<tr>
<td>R</td>
<td>0.37 ± .03</td>
<td>9.40 ± .76</td>
</tr>
<tr>
<td>S</td>
<td>0.46 ± .03</td>
<td>11.68 ± .76</td>
</tr>
<tr>
<td>T</td>
<td>0.200 Min.</td>
<td>5.08 Min.</td>
</tr>
<tr>
<td>U</td>
<td>0.250 Min.</td>
<td>6.35 Min.</td>
</tr>
<tr>
<td>V</td>
<td>0.105 Min.</td>
<td>2.66 Min.</td>
</tr>
</tbody>
</table>
C Band Klystron

- Gang Tuned Cavities
- Air Cooled
- High Efficiency
- High Power Gain
- Compact
- Sturdy

Frequency ........................................ 4.4 to 5.0 GHz

ELECTRICAL
Cathode .............................................. Indirectly-heated Tungsten Dispenser Cathode
Filament:
  Voltage ........................................... 6.5 ± 0.5 V
  Current at 6.5 V .................................. 7.6 A
  Maximum current ................................ 8.2 A
  Warmup time (min.) ............................... 180 s

MECHANICAL
Mounting Position .................................. Any
Length (max.) ....................................... (393 mm) 15.5 in
Width (max.) ........................................ (267 mm) 10.5 in
Weight (approx.) ................................... (17.2 kg) 38 lb
  In commercial pack ............................. (18.1 kg) 40 lb
  In military pack ................................. (22.5 kg) 50 lb

THERMAL
Collector Temperature (max.) .................... 260 °C
Body Temperature (max.) ........................ 150 °C
Tuner Fin Temperature (max.) .................... 150 °C
Electron Gun Potting
  Insulation temperature (max.) ............... 250 °C
  Storage temperature (min.) .................. -65 °C
Cooling
  Forced air flow across the collector, body, and tuner, is required.
  Typical air requirements for operation with 20°C ambient air temperature at sea level are:

<table>
<thead>
<tr>
<th></th>
<th>Min Air Flow</th>
<th>Reg Air Flow</th>
<th>Max Press-Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb/min</td>
<td>kg/min</td>
<td>in H₂O</td>
</tr>
<tr>
<td>Collector</td>
<td>7.5</td>
<td>3.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Body &amp; Tuners</td>
<td>0.85</td>
<td>0.38</td>
<td>0.75</td>
</tr>
</tbody>
</table>

RCA Electronic Components
**PERFORMANCE**

Maximum CW Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Beam Voltage</td>
<td>8.5</td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>600</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>DC Body Current</td>
<td>60</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Surge Current</td>
<td>25</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>2.0:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input VSWR</td>
<td>2.0:1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Typical CW Operation:

High Efficiency Tuned

<table>
<thead>
<tr>
<th>Frequency</th>
<th>4.4 GHz</th>
<th>5.0 GHz</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Beam Voltage</td>
<td>7.5</td>
<td>7.5</td>
<td>kV</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>490</td>
<td>490</td>
<td>mA</td>
</tr>
</tbody>
</table>

High Efficiency Tuned

<table>
<thead>
<tr>
<th>Frequency</th>
<th>4.4 GHz</th>
<th>5.0 GHz</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Body Current</td>
<td>10.0</td>
<td>10.0</td>
<td>mA</td>
</tr>
<tr>
<td>RF Power Output</td>
<td>1.45</td>
<td>1.30</td>
<td>kW</td>
</tr>
<tr>
<td>Bandwidth (3 dB)</td>
<td>8.0</td>
<td>10.0</td>
<td>MHz</td>
</tr>
<tr>
<td>Efficiency</td>
<td>39.0</td>
<td>35.0</td>
<td>%</td>
</tr>
<tr>
<td>Gain</td>
<td>44.0</td>
<td>44.0</td>
<td>dB</td>
</tr>
<tr>
<td>Drive</td>
<td>50.0</td>
<td>50.0</td>
<td>mW</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>1.05:1</td>
<td>1.05:1</td>
<td></td>
</tr>
<tr>
<td>Input VSWR</td>
<td>1.3:1</td>
<td>1.3:1</td>
<td></td>
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</tbody>
</table>

High Gain Tuned

<table>
<thead>
<tr>
<th>Frequency</th>
<th>4.4 GHz</th>
<th>5.0 GHz</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Beam Voltage</td>
<td>7.5</td>
<td>7.5</td>
<td>kV</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>490</td>
<td>490</td>
<td>mA</td>
</tr>
<tr>
<td>DC Body Current</td>
<td>10.0</td>
<td>10.0</td>
<td>mA</td>
</tr>
<tr>
<td>RF Power Output</td>
<td>1.30</td>
<td>1.15</td>
<td>kW</td>
</tr>
<tr>
<td>Bandwidth (3 dB)</td>
<td>6.0</td>
<td>8.0</td>
<td>MHz</td>
</tr>
<tr>
<td>Efficiency</td>
<td>35.0</td>
<td>31.0</td>
<td>%</td>
</tr>
<tr>
<td>Gain</td>
<td>51.0</td>
<td>51.0</td>
<td>dB</td>
</tr>
<tr>
<td>Drive</td>
<td>10.0</td>
<td>10.0</td>
<td>mW</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>1.05:1</td>
<td>1.05:1</td>
<td></td>
</tr>
<tr>
<td>Input VSWR</td>
<td>1.3:1</td>
<td>1.3:1</td>
<td></td>
</tr>
</tbody>
</table>
**Broadband Tuned**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>4.4 GHz</th>
<th>5.0 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4.4 GHz</td>
<td>5.0 GHz</td>
</tr>
<tr>
<td>DC Beam Voltage</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>DC Body Current</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>RF Power Output</td>
<td>1.35</td>
<td>1.25</td>
</tr>
<tr>
<td>Bandwidth (3 dB)</td>
<td>13.0</td>
<td>19.0</td>
</tr>
<tr>
<td>Efficiency</td>
<td>36.0</td>
<td>33.0</td>
</tr>
<tr>
<td>Gain</td>
<td>41.0</td>
<td>41.0</td>
</tr>
<tr>
<td>Drive</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>1.05:1</td>
<td>1.05:1</td>
</tr>
<tr>
<td>Input VSWR</td>
<td>1.3:1</td>
<td>1.3:1</td>
</tr>
</tbody>
</table>

**GENERAL INFORMATION**

**Installation and Operation**

No installation or operation should be attempted without first consulting the Installation and Operating Instructions shipped with each tube or available on request from Super Power Marketing, RCA, Lancaster, PA.

RCA reference publications required for the installation and operation of this device include the following:

- **Data Sheet** – RCA-4658
- **Application Note** AN 4213
- **Application Guide** 1CE-279A

These publications are available as a complete packet – request PWR 543 "Applications Information for the RCA-4658 klystron."

**Personnel Safety**

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

**Packaging**

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

---

**RCA**

Electronic Components
The Commercial Pack is made of nesting cardboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses a hermetically-sealed metal container which protects the tube and serves to shield the area surrounding the pack from stray magnetic fields set up by the klystron focusing magnet.

In shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning system. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

**Cooling**

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See Outline Drawing.

**Mounting**

Four holes are provided in the gun-end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

**Thermocouple**

A thermocouple mounted on the collector provides a signal output for excessive collector temperature. This output is used to operate protective circuitry.

**Tuning**

Tuning is accomplished by a single knob which "gang-tunes" all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

**Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Guide 1CE-279A for complete information on protection circuits.
DIMENSIONAL OUTLINE
(Top View)

NAME PLATE AND SERIAL NUMBER

ENLARGED END VIEW OF SHAFTS

ADJ

AL

(4) SHAFTS

Bottom View

TUNER COVER

TABULATED DIMENSIONS for the Outline Drawing

<table>
<thead>
<tr>
<th>Dimension Reference</th>
<th>Specified Values</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15.5 max.</td>
<td>393.7 max.</td>
</tr>
<tr>
<td>B</td>
<td>4.06 ± .12</td>
<td>103.1 ± 3.0</td>
</tr>
<tr>
<td>C</td>
<td>1.80 ± .12</td>
<td>45.7 ± 3.0</td>
</tr>
<tr>
<td>D</td>
<td>3.5 max.</td>
<td>88.9 max.</td>
</tr>
<tr>
<td>E</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
</tr>
<tr>
<td>F</td>
<td>3.80 ± .12</td>
<td>96.6 ± 3.0</td>
</tr>
</tbody>
</table>

(1) HOLE GROUNDING TERMINAL MARKED E1 (NOTE 1)

NOTE II

NOTE 6

NOTE 7

Electronic Components
### TABULATED DIMENSIONS (Cont’d)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0.68 ± 0.06</td>
<td>17.3 ± 1.3</td>
</tr>
<tr>
<td>H</td>
<td>1.80 ± 0.09</td>
<td>45.7 ± 2.3</td>
</tr>
<tr>
<td>J</td>
<td>0.68 ± 0.15</td>
<td>17.3 ± 3.8</td>
</tr>
<tr>
<td>K</td>
<td>6.25 max.</td>
<td>158.8 max.</td>
</tr>
<tr>
<td>M</td>
<td>1.50 ± 0.03</td>
<td>38.1 ± 0.8</td>
</tr>
<tr>
<td>N Dia.</td>
<td>4.12 ± 0.03</td>
<td>101.6 ± 0.8</td>
</tr>
<tr>
<td>P Dia.</td>
<td>2.130 ± 0.015</td>
<td>54.10 ± 0.38</td>
</tr>
<tr>
<td>R</td>
<td>10.5 max.</td>
<td>266.7 max.</td>
</tr>
<tr>
<td>S</td>
<td>6.5 ± 0.5</td>
<td>165.0 ± 13.0</td>
</tr>
<tr>
<td>T</td>
<td>0.50 ± 0.12</td>
<td>12.7 ± 3.0</td>
</tr>
<tr>
<td>U</td>
<td>15.00 ± 0.25</td>
<td>381.0 ± 6.0</td>
</tr>
<tr>
<td>V</td>
<td>3.25 max.</td>
<td>82.55 max.</td>
</tr>
<tr>
<td>W</td>
<td>5.00 ± 0.06</td>
<td>127.0 ± 1.5</td>
</tr>
<tr>
<td>X</td>
<td>2.50 ± 0.06</td>
<td>63.5 ± 1.5</td>
</tr>
<tr>
<td>Y</td>
<td>1.00 ± 0.06</td>
<td>25.4 ± 1.5</td>
</tr>
<tr>
<td>Z</td>
<td>2.00 ± 0.06</td>
<td>50.8 ± 1.5</td>
</tr>
<tr>
<td>AA</td>
<td>3.00 ± 0.06</td>
<td>76.2 ± 1.5</td>
</tr>
<tr>
<td>AB</td>
<td>2.10 ± 0.02</td>
<td>53.34 ± 0.51</td>
</tr>
<tr>
<td>AD</td>
<td>1.00 ± 0.03</td>
<td>25.4 ± 0.8</td>
</tr>
<tr>
<td>AE</td>
<td>2.00 ± 0.03</td>
<td>60.8 ± 0.8</td>
</tr>
<tr>
<td>AK</td>
<td>0.440 ± 0.010</td>
<td>11.18 ± 0.25</td>
</tr>
<tr>
<td>AL</td>
<td>0.230 ± 0.005</td>
<td>5.84 ± 0.13</td>
</tr>
<tr>
<td>AM Dia.</td>
<td>0.249 ± 0.002</td>
<td>6.325 ± 0.051</td>
</tr>
<tr>
<td>AP</td>
<td>3.00 ± 0.06</td>
<td>76.2 ± 1.5</td>
</tr>
<tr>
<td>AR</td>
<td>4.75 ± 0.12</td>
<td>120.6 ± 3.0</td>
</tr>
</tbody>
</table>

### NOTES FOR OUTLINE DRAWINGS

1. Mates with Type “N” Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No.’s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250” ± 0.032” (82.6 ± 0.8 mm) dia. circle.
6. Holes 0.437” ± 0.082” (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation
   Heater Lead — Yellow
   Heater-Cathode Lead — White

8. Thru-holes checked with gauge.

9. Three spaces between shafts are 0.70'' ± 0.03'' (17.8 ± 0.8 mm) and add to 2.100'' (53.34 mm). Shafts are numbered as shown.

10. Tolerance for this dimension applies to location of four 0.201'' (5.11 mm) holes.

11. Hole #6-32 UNC-2B, 0.25'' (6.35 mm) minimum depth.

**BEAM CURRENT CHARACTERISTIC CURVE**

- $E_f = 6.5\ V$
- $I_f = 7.5\ A$

---

**RCA Electronic Components**

DATA 4
GAIN CHARACTERISTIC CURVE

- $E_b = 7.5 \text{ kV dc}$
- $E_b = 8.0 \text{ kV dc}$
- $E_f = 6.5 \text{ V}$
- $f_0 = 4.7 \text{ GHz}$

POWER OUTPUT - KILOWATTS

DRIVE POWER - MILLIWATTS

BANDWIDTH CHARACTERISTIC CURVE

- $E_b = 7.5 \text{ kV dc}$
- $I_b = 0.49 \text{ A dc}$
- $E_f = 6.5 \text{ V}$
- $f_0 = 50 \text{ GHz}$

FREQUENCY - MHz

Electronic Components

DATA 5

4-71
5.0 Kilowatts Pulsed Power Output  
High Efficiency — High Power Gain  
Compact — Sturdy  
Gang-Tuned Cavities  
Air Cooled

**ELECTRICAL**

Cathode ........ Indirectly-Heated Tungsten Dispenser Cathode  
Filament  
Voltage ........................................... 6.5 ± 0.5 V  
Current (at 6.5 V) ................................ 7.6 A  
Current (maximum) ................................ 8.2 A  
Warm-Up Time ................................... 180 s

**MECHANICAL**

Mounting Position .................. Any  
Length (maximum) .................... (393 mm) 15.5 in  
Width (maximum) ...................... (267 mm) 10.5 in  
Weight (approx.)  
Uncrated .................. (17.2 kg) 38 lb  
In commercial pack .............. (18.1 kg) 40 lb  
In military pack ................. (22.5 kg) 50 lb

**THERMAL**

Collector Temperature (maximum) ............. 260 °C  
Body Temperature (maximum) .................. 150 °C  
Tuner Fin Temperature (maximum) ............ 150 °C  
Electron Gun Temperature  
Insulation (maximum) ................. 250 °C  
Storage (minimum) ...................... -65 °C  
Cooling: Forced air flow across the collector, body and tuner is required.  
Typical air-flow requirements  
(20 °C at sea level pressure)  

<table>
<thead>
<tr>
<th>Component</th>
<th>Min. Air Flow lbs/min.</th>
<th>Max. Press Drop in H₂O</th>
<th>Max. Press Drop cm H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector</td>
<td>7.5</td>
<td>2.0</td>
<td>5.1</td>
</tr>
<tr>
<td>Body and Tuner</td>
<td>0.85</td>
<td>0.75</td>
<td>1.9</td>
</tr>
</tbody>
</table>

RCA Electronic Components
Typical Rating as a Pulsed RF Amplifier

MAXIMUM RATINGS, Absolute-Maximum Values:

- Pulsed Beam Voltage: 14.0 max. kV
- Pulsed Beam Current: 1.6 max. A
- Pulse Width: 500 µsec
- Duty: 0.2%

TYPICAL PULSED OPERATION

- Frequency: 4.7 GHz
- Pulsed Beam Voltage: 12.0 kV
- Pulsed Beam Current: 1.4 A
- Pulsed Power Output*: 5.0 kW
- Power Gain: 50.0 dB
- Efficiency: 30.0%
- Pulse Width: 5.0 µsec
- Duty: 0.2%

*A waveguide transformer was used to optimize the power output at the stated frequency.

GENERAL INFORMATION

Installation and Operation

No installation or operation should be attempted prior to consulting the Installation and Operating instructions shipped with each tube or available upon request from Super Power Tube Marketing, RCA Lancaster, PA 17604.

RCA reference publications helpful for installation and operation include the following:

- Data Sheet — RCA 4659, RCA 4660
- Application Note — AN 4213
- Application Guide — 1CE-279

These publications are available as complete packets—Request PWR-544, “Application Information for the RCA 4569 Klystron.”

Request PWR-545, “Application Information for the RCA 4660 Klystron.”
Personnel Safety

The high voltages and microwave radiations from these devices can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

These devices, in operation, may produce X-Radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.

The Commercial Pack is made of nesting, cardboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses an hermetically-sealed, metal container which protects the tube and serves to shield the surrounding area from stray magnetic fields set up by the klystron focusing magnet.

During shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning systems. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See the Outline Drawing.

Mounting

Four holes are provided in the gun end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.
Thermocouple

A thermocouple, mounted on the collector, provides a signal which will indicate excessive collector temperature. This output can be used to operate protective circuitry.

Tuning

Tuning is accomplished by a single knob which gang tunes all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

Protection circuits serve a three fold purpose: safety of personnel, protection of the tube, and protection of the circuits. Consult "Application Guide" 1CE-279 for complete information on protection circuits.

NOTES FOR OUTLINE DRAWINGS (BOTH TYPES)

1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No.'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250" ± .032" (82.6 ± .8 mm) dia. circle.
6. Holes 0.437" ± .062" (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation
   Heater Lead – Yellow
   Heater-Cathode Lead – White
8. Thru-holes checked with gauge.
9. Three spaces between shafts are 0.70" ± .03" (17.8 ± .8 mm) and add to 2.100" (53.34 mm). Shafts are numbered as shown.
10. Tolerance for this dimension applies to location of four 0.201" (5.11 mm) holes.
11. Hole #6-32 UNC-2B, 0.25" (6.35 mm) minimum depth.
<table>
<thead>
<tr>
<th>Dimension Reference</th>
<th>Specified Values</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15.5 max.</td>
<td>393.7 max.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>4.06 ± .12</td>
<td>103.1 ± 3.0</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1.80 ± .12</td>
<td>45.7 ± 3.0</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>3.5 max.</td>
<td>88.9 max.</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3.80 ± .12</td>
<td>96.5 ± 3.0</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>0.68 ± .05</td>
<td>17.3 ± 1.3</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>1.80 ± .09</td>
<td>45.7 ± 2.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ .15</td>
<td>+ 3.8</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>0.68 ± .10</td>
<td>17.3 ± 2.5</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>6.25 max.</td>
<td>158.8 max.</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1.50 ± .03</td>
<td>38.1 ± .8</td>
<td></td>
</tr>
<tr>
<td>N Dia.</td>
<td>4.12 ± .03</td>
<td>101.6 ± .8</td>
<td></td>
</tr>
<tr>
<td>P Dia.</td>
<td>2.130 ± .015</td>
<td>54.10 ± .38</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>10.5 max.</td>
<td>266.7 max.</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>6.5 ± .5</td>
<td>165 ± 13.0</td>
<td></td>
</tr>
<tr>
<td>T Dia.</td>
<td>0.250 ± .015</td>
<td>6.35 ± .38</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>13.50 ± .25</td>
<td>343.0 ± 6.0</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>3.25 max.</td>
<td>82.55 max.</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>5.00 ± .06</td>
<td>127.0 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>2.50 ± .06</td>
<td>63.5 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>1.00 ± .06</td>
<td>25.4 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>2.00 ± .06</td>
<td>50.8 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>AB</td>
<td>2.10 ± .02</td>
<td>53.34 ± .51</td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td>0.201 ± .010</td>
<td>5.11 ± .25</td>
<td></td>
</tr>
<tr>
<td>AD</td>
<td>1.00 ± .03</td>
<td>25.4 ± .8</td>
<td></td>
</tr>
<tr>
<td>AE</td>
<td>2.00 ± .03</td>
<td>50.8 ± .8</td>
<td></td>
</tr>
<tr>
<td>AF</td>
<td>3.25 ± .02</td>
<td>82.55 ± .51</td>
<td></td>
</tr>
<tr>
<td>AG</td>
<td>3.75 ± .03</td>
<td>95.3 ± .8</td>
<td></td>
</tr>
<tr>
<td>AH</td>
<td>0.25 ± .03</td>
<td>6.4 ± .8</td>
<td></td>
</tr>
<tr>
<td>AJ</td>
<td>0.62 ± .03</td>
<td>15.8 ± .8</td>
<td></td>
</tr>
<tr>
<td>AK</td>
<td>0.440 ± .010</td>
<td>11.18 ± .25</td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>0.230 ± .005</td>
<td>5.84 ± .13</td>
<td></td>
</tr>
<tr>
<td>AM Dia.</td>
<td>0.249 ± .002</td>
<td>6.325 ± .051</td>
<td></td>
</tr>
<tr>
<td>AN</td>
<td>0.125 ± .030</td>
<td>3.2 ± .8</td>
<td></td>
</tr>
<tr>
<td>AP</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
<td></td>
</tr>
<tr>
<td>AR</td>
<td>4.75 ± .12</td>
<td>120.6 ± 3.0</td>
<td></td>
</tr>
</tbody>
</table>
DIMENSIONAL OUTLINE (4660)

NAME PLATE AND SERIAL NUMBER

(4) SHAFTS

TOP VIEW

(1) HOLE GROUNDING TERMINAL MARKED E1 (NOTE 11)

ENLARGED END VIEW OF SHAFTS

TUNER COVER

BOTTOM VIEW

(4) HOLES (NOTE 6)

NOTE 7
## TABULATED DIMENSIONS FOR THE OUTLINE DRAWING (4660)

<table>
<thead>
<tr>
<th>Dimension Reference</th>
<th>Specified Values Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15.5 max.</td>
<td>393.7 max.</td>
</tr>
<tr>
<td>B</td>
<td>4.06 ± .12</td>
<td>103.1 ± 3.0</td>
</tr>
<tr>
<td>C</td>
<td>1.80 ± .12</td>
<td>45.7 ± 3.0</td>
</tr>
<tr>
<td>D</td>
<td>3.5 max.</td>
<td>88.9 max.</td>
</tr>
<tr>
<td>E</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
</tr>
<tr>
<td>F</td>
<td>3.80 ± .12</td>
<td>96.5 ± 3.0</td>
</tr>
<tr>
<td>G</td>
<td>0.68 ± .05</td>
<td>17.3 ± 1.3</td>
</tr>
<tr>
<td>H</td>
<td>1.80 ± .09 + .15</td>
<td>45.7 ± 2.3</td>
</tr>
<tr>
<td>J</td>
<td>0.68 ± .10</td>
<td>17.3 ± 2.5</td>
</tr>
<tr>
<td>K</td>
<td>6.25 max.</td>
<td>158.8 max.</td>
</tr>
<tr>
<td>M</td>
<td>1.50 ± .03</td>
<td>38.1 ± 0.8</td>
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<tr>
<td>N</td>
<td>4.12 ± .03</td>
<td>101.6 ± 0.8</td>
</tr>
<tr>
<td>P</td>
<td>2.130 ± .015</td>
<td>54.10 ± .38</td>
</tr>
<tr>
<td>R</td>
<td>10.5 max.</td>
<td>266.7 max.</td>
</tr>
<tr>
<td>S</td>
<td>6.5 ± .5</td>
<td>165 ± 13.0</td>
</tr>
<tr>
<td>T</td>
<td>0.50 ± .12</td>
<td>12.7 ± 3.0</td>
</tr>
<tr>
<td>U</td>
<td>15.00 ± .25</td>
<td>381.0 ± 6.0</td>
</tr>
<tr>
<td>V</td>
<td>3.25 max.</td>
<td>82.55 max.</td>
</tr>
<tr>
<td>W</td>
<td>5.00 ± .06</td>
<td>127.0 ± 1.5</td>
</tr>
<tr>
<td>X</td>
<td>2.50 ± .06</td>
<td>63.5 ± 1.5</td>
</tr>
<tr>
<td>Y</td>
<td>1.00 ± .06</td>
<td>25.4 ± 1.5</td>
</tr>
<tr>
<td>Z</td>
<td>2.00 ± .06</td>
<td>50.8 ± 1.5</td>
</tr>
<tr>
<td>AA</td>
<td>3.00 ± .06</td>
<td>76.2 ± 1.5</td>
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<td>53.34 ± .51</td>
</tr>
<tr>
<td>AD</td>
<td>1.00 ± .03</td>
<td>25.4 ± 0.8</td>
</tr>
<tr>
<td>AE</td>
<td>2.00 ± .03</td>
<td>50.8 ± 0.8</td>
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<td>76.2 ± 1.5</td>
</tr>
<tr>
<td>AR</td>
<td>4.75 ± .12</td>
<td>120.6 ± 3.0</td>
</tr>
</tbody>
</table>
Beam Power Tube

Cermolox
Ruggedized

Forced-Air Cooled
Full Input to 400 MHz

ELECTRICAL

Heater-Cathode:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Unipotential, Oxide Coated, Matrix Type</td>
</tr>
<tr>
<td>Voltage(^a) (AC or DC)</td>
<td>5.5 typ. V</td>
</tr>
<tr>
<td></td>
<td>5.8 max. V</td>
</tr>
<tr>
<td>Current (@ 5.5 V)</td>
<td>17.3 A</td>
</tr>
<tr>
<td>Minimum heating time</td>
<td>180 s</td>
</tr>
<tr>
<td>Mu Factor(^b) (Grid No.1 to Grid No.2)</td>
<td>6.5</td>
</tr>
</tbody>
</table>

Direct Inter-electrode Capacitances:

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to plate(^c)</td>
<td>0.14 pF</td>
</tr>
<tr>
<td>Grid No.1 to Cathode-Heater</td>
<td>38 pF</td>
</tr>
<tr>
<td>Plate to Cathode-Heater(^c)</td>
<td>0.02 pF</td>
</tr>
<tr>
<td>Grid No.1 to Grid No.2</td>
<td>52 pF</td>
</tr>
<tr>
<td>Grid No.2 to Plate</td>
<td>13 pF</td>
</tr>
<tr>
<td>Grid No.2 to Cathode-Heater(^c)</td>
<td>1.4 pF</td>
</tr>
</tbody>
</table>

MECHANICAL

Operating Position: Any
Maximum Length: (98.0 mm) 3.86 in
Greatest Diameter: (94.7 mm) 3.73 in
Terminal Connection: See Dimensional Outline
Radiator: Integral part of tube
Weight (Approx.): (0.9 kg) 2 lb

Sockets may be obtained from:
Erie Technological Products, Inc.
644 West 12th Street, Erie, PA 16512
Jettron Products Incorporated
56 Route 10, Hanover, NJ 07936

THERMAL

Ceramic-Metal Interface Temperature\(^d\) 260 max. °C
(Plate, grid No.1, grid No.2, cathode-heater, and heater)
Plate Core Temperature\(^d\) 250 max. °C

RCA Electronic Components

DATA 1 11-70
**LINEAR RF POWER AMPLIFIER**
**AM TELEPHONY SERVICE, CLASS AB**

Carrier conditions for use with a maximum modulation factor of 1.0

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>3500 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>700 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>50 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1500 max. W</td>
</tr>
</tbody>
</table>

Calculated CCS Operation as a Class AB Amplifier:

In a cathode-drive circuit at 400 MHz with an output circuit bandwidth of 4.5 MHz:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2600 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>550 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-75 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>490 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>-15 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0 mA</td>
</tr>
<tr>
<td>Drive Power (Approx.)</td>
<td>18 W</td>
</tr>
<tr>
<td>Output Circuit Eff. (Approx.)</td>
<td>90 %</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>280 W</td>
</tr>
</tbody>
</table>

**RF POWER AMPLIFIER & OSCILLATOR — CLASS C TELEGRAPHY**
**AND**
**RF POWER AMPLIFIER — CLASS C FM TELEPHONY**

Maximum CCS Ratings — Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>3500 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.25 max. A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.2 max. A</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>50 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1500 max. W</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance</td>
<td>5000 max. Ω</td>
</tr>
<tr>
<td>Grid-No.2-Circuit Impedance</td>
<td>See note g</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td>See note f</td>
</tr>
</tbody>
</table>
Calculated CCS Operation:
In a cathode-drive circuit at 400 MHz with an output circuit bandwidth of 4.4 MHz:

DC Plate Voltage ........................................ 2600 V
DC Grid-No.2 Voltage ..................................... 550 V
DC Grid-No.1 Voltage^[m] .................................. -85 V
DC Plate Current ......................................... 900 mA
DC Grid-No.2 Current ..................................... -10 mA
DC Grid-No.1 Current ..................................... 5 mA
Drive Power (Approx.) ................................... 70 W
Output Circuit Eff. (Approx.) .......................... 90 %
Useful Power Output ..................................... 1180 W

b For: plate voltage = 2500 V
   grid No.2 voltage = 600 V
   plate current = 600 mA

c With special shield adapter.

d See Dimensional Outline for temperature measurement points.

j Computed between half-power points using two times tube capacity.

k Adjust for zero-signal DC plate current of 0.2 A.

m Adjust for zero-signal DC plate current of 0.1 A.

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

a See Electrical Considerations — Filament or Heater.

b See Classes of Service

c See Electrical Considerations — Plate Voltage Supply

g See Electrical Considerations — Grid No. 2 Voltage Supply

h See Electrical Considerations — Grid No. 1 Voltage Supply
## OUTLINE TABULATED DIMENSIONS

### Dimensions | Value |  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A Dia.</strong></td>
<td>3.70 ± .03</td>
<td>93.98 ± .76</td>
</tr>
<tr>
<td><strong>B Dia.</strong></td>
<td>3.210 min.</td>
<td>81.54 min.</td>
</tr>
<tr>
<td><strong>C Dia.</strong></td>
<td>3.010 min.</td>
<td>76.45 min.</td>
</tr>
<tr>
<td><strong>D Dia.</strong></td>
<td>2.307 min.</td>
<td>58.60 min.</td>
</tr>
<tr>
<td><strong>E Dia.</strong></td>
<td>1.700 min.</td>
<td>43.18 min.</td>
</tr>
<tr>
<td><strong>F Dia.</strong></td>
<td>0.725 max.</td>
<td>18.41 max.</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>3.76 ± .10</td>
<td>96.5 ± 2.5</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>3.30 ± .10</td>
<td>83.8 ± 2.5</td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>1.65 ± .03</td>
<td>41.91 ± .76</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>0.200 ± .025</td>
<td>5.08 ± .64</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>0.37 ± .03</td>
<td>9.40 ± .76</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.46 ± .03</td>
<td>11.68 ± .76</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td>0.250 min.</td>
<td>6.36 min.</td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>0.105 min.</td>
<td>2.67 min.</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>0.200 min.</td>
<td>5.08 min.</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>0.620 min.</td>
<td>15.75 min.</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td>2.71 ± .10</td>
<td>68.8 ± 2.5</td>
</tr>
</tbody>
</table>

### OUTLINE NOTES

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

| **Terminal** | **Dimensional Value** |  
|---|---|---|
| **1.a Radiator** | 0.620 | 15.75 |
| **1.b Plate** | 0.220 | 5.59 |
| **1.c Grid No.2** | 0.220 | 5.59 |
| **1.d Grid No.1** | 0.175 | 4.45 |
| **1.e Heater-Cathode** | 0.115 | 2.92 |
| **1.f Heater** | 0.136 | 3.43 |

**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 RCA Power Tube Application Engineering, Lancaster, PA, for guidance.

\*Basic dimensions are in inches unless otherwise specified. Metric dimensions are derived from the basic inch dimensions (One inch = 25.4 mm).
TABULATED DIMENSIONS

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.8 (71.)</td>
</tr>
<tr>
<td>B</td>
<td>1.8 (46.)</td>
</tr>
<tr>
<td>C Radius</td>
<td>0.06 (1.5)</td>
</tr>
<tr>
<td>D Radius</td>
<td>0.06 (1.5)</td>
</tr>
<tr>
<td>E</td>
<td>0.7 (18.)</td>
</tr>
<tr>
<td>F Dia.</td>
<td>0.250 (6.35)</td>
</tr>
<tr>
<td>G Radius</td>
<td>1.015 (25.78)</td>
</tr>
<tr>
<td>H</td>
<td>0.75 (19.)</td>
</tr>
<tr>
<td>J Dia.</td>
<td>0.140 (3.56)</td>
</tr>
<tr>
<td>K</td>
<td>8.3° 0.145 radians</td>
</tr>
<tr>
<td>M</td>
<td>4.5° 0.078 radians</td>
</tr>
</tbody>
</table>

Notes:
1. Material 1/16'' thick cold rolled steel.
2. Round all edges
3. Slot between holes

*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions (1 inch = 25.4 mm).
ELECTRODE CAVITY TUNING CHARACTERISTICS

GRID No 2 (G2)
TO PLATE (P)

CAVITY LENGTH(L) - INCHES

FREQUENCY - MHz

Detailed performance and application information is available through your RCA Sales Office Distributor, or write to RCA Commercial Engineering, Harrison, N. J. 07029
UHF Power Amplifier

Ruggedized Forced-Air Cooled

300 W CW Output at 470 MHz
380 W PEP Output at 30 MHz

ELECTRICAL

Heater, for Unipotential Cathode:
- Voltage (AC or DC)\(^{a}\) .................................................. 13.5 V
- Current at 13.5 volts .................................................. 1.3 A
- Minimum heating time .................................................. 60 s

Mu-Factor, (Grid No.2 to Grid No.1)\(^{b}\) .................................. 12

Direct Interelectrode Capacitances:\(^{c}\)
- Grid No.1 to plate .................................................. 0.15 max. pF
- Grid No.1 to cathode .................................................. 16 pF
- Plate to cathode .................................................. 0.01 pF
- Grid No.1 to grid No.2 .................................................. 24 pF
- Grid No.2 to plate .................................................. 7.0 pF
- Grid No.2 to cathode .................................................. 2.7 pF
- Cathode to heater .................................................. 3.3 pF

MECHANICAL

Operating Position .................................................. Any

Maximum Overall Length .................................................. (57.40 mm) 2.26"

Seated Length .................................................. (48.8 ± 1.7 mm) 1.920" ± 0.065"

Greatest Diameter .................................................. (41.28 ± 0.38 mm) 1.625" ± 0.015"

Base .................................................. Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-81)

Socket .................................................. Erie\(^{d}\) No.9802-000 and 9804-000, Johnson\(^{e}\) No.124-311-100 or equivalent

Grid No.2 Bypass Capacitor .................................................. Erie No.2943-002, Johnson No.124-121, or equivalent

Weight (Approx.) .................................................. 3.5 oz

THERMAL

Terminal Seal Temperature\(^{g}\) (All Terminals) .................................................. 250 max. °C

Radiator Core Temperature\(^{g}\) .................................................. 250 max. °C

Air Flow:

See Typical Cooling Requirements curves and Forced-Air Cooling

\(^{a}\) Voltage (AC or DC)

\(^{b}\) Mu-Factor, (Grid No.2 to Grid No.1)

\(^{c}\) Direct Interelectrode Capacitances

\(^{d}\) Erie

\(^{e}\) Johnson

\(^{g}\) Terminal Seal Temperature, Radiator Core Temperature
LINEAR RF POWER AMPLIFIER

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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 500 MHz</td>
<td></td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>2200 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>450k max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>400 max. W</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 max. W</td>
</tr>
</tbody>
</table>

Peak Heater-Cathode Voltage:

- Heater negative with respect to cathode: 150 max. V
- Heater positive with respect to cathode: 150 max. V

MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance

Under Any Condition: m

- With fixed bias: 25000 max. Ω
- With fixed bias (in Class AB₁ operation): 100000 max. Ω
- With cathode bias: Not recommended

Grid-No.2 Circuit Impedance n: 1000 max. Ω

Plate Circuit Impedance: See Note p

TYPICAL CCS OPERATION AT 30 MHz WITH “TWO-TONE MODULATION”

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-35 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>3050 Ω</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>335 mA</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>250 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td>10 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>7 mA</td>
</tr>
</tbody>
</table>
DC Grid-No.1 Current at Peak of Envelope ........................................... 0.05\textsuperscript{r} mA
Peak-Envelope Driver Power Output (Approx.) ........................................... 0.3 W
Output-Circuit Efficiency (Approx.) ......................................................... 90 \%
Distortion Products Level:
Third order ........................................... 29\textsuperscript{5} dB
Fifth order ........................................... 32 dB
Useful Power Output (Approx.):
Average ........................................... 190 W
Peak envelope ........................................... 380 W
RF POWER AMPLIFIER & OSCILLATOR – CLASS C TELEGRAPHY\textsuperscript{h} AND RF POWER AMPLIFIER – CLASS C FM TELEPHONY\textsuperscript{h}
MAXIMUM CCS RATINGS, Absolute-Maximum Values:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>400 max. W</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>150 max. V</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>150 max. V</td>
</tr>
</tbody>
</table>
MAXIMUM CIRCUIT VALUES
Grid-No.1 Circuit Resistance
Under Any Condition:
With fixed bias ........................................... 25000 max. \( \Omega \)
Grid-No.2 Circuit Impedance ........................................... 10000 max. \( \Omega \)
Plate Circuit Impedance ........................................... See Note \textsuperscript{p}
TYPICAL CCS OPERATION
In Grid-Drive Circuit at 50 MHz
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>700 1000 1500 2000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>175 200 200 200 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10 -30 -30 -30 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 300 300 300 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>25 20 20 20 mA</td>
</tr>
</tbody>
</table>

IECEDEI Electronic Components
DC Grid-No.1 Current ................. 50 40 40 30 mA
Driver Power Output (Approx.) ....... 1.2 2 2 2 W
Useful Power Output .................. 120 175 275 375 W

In Grid-Drive Circuit at 470 MHz

DC Plate Voltage ...................... 700 1000 1500 2000 V
DC Grid-No.2 Voltage ................. 200 200 200 200 V
DC Grid-No.1 Voltage ................. -30 -30 -30 -30 V
DC Plate Current ...................... 300 300 300 300 mA
DC Grid-No.2 Current ................. 10 10 5 5 mA
DC Grid-No.1 Current ................. 30 30 30 30 mA
Driver Power Output (Approx.) ....... 5 5 5 5 W
Useful Power Output .................. 100 165 236 300 W

PLATE-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:

<table>
<thead>
<tr>
<th></th>
<th>Up to 500 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1800 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>5 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>280 max. W</td>
</tr>
</tbody>
</table>

a  Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz heater volts = 12.5 (approx.).

b  For plate voltage = 450 V
Grid No.2 voltage = 325 V
Plate current = 1.2 A

c  Measured with special shield adapter.

d  Erie Technological Products, Inc., 645 West 12th Street, Erie, PA 16501

e  E.F. Johnson Co., 1921 10th Ave., S.W. Waseca, MN 56093
See Dimensional Outline for Temperature Measurement Points.

See *RCA Transmitting Tube Operating Considerations - CLASSES OF SERVICE* given at the front of this section.

The tube shall see an effective plate-supply impedance of no less than 750 ohms. A fault current limiting resistor of no less than 15 ohms is to be used between the output filter capacitance and the tube plate. The plate-supply-output-filter capacitance is to be no greater than 10 \( \mu F \).

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 300 mA. During short periods of circuit adjustment under “Single-Tone” conditions, the average plate current may be as high as 450 mA.

A fault current limiting resistor of no less than 20 ohms is to be used between the bias supply output filter capacitance and the tube grid-No.1. The bias supply output filter capacitance is to be no greater than 150 \( \mu F \).

A fault current limiting resistor of no less than 320 ohms is to be used between the screen output filter capacitance and the tube screen. The screen supply output filter capacitance is to be no greater than 80 \( \mu F \).

The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

The value of third order distortion product level shown may be improved by approximately 5 dB by utilizing an unbypassed, non-inductive 20-ohm resistor between the cathode and ground; a slight increase in drive power will be required.

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td>1.15</td>
<td>1.45</td>
<td>A</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>0.15</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>14.6</td>
<td>18.0</td>
<td>pF</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>0.004</td>
<td>0.016</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>20.0</td>
<td>26.5</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>6.3</td>
<td>7.7</td>
<td>pF</td>
</tr>
</tbody>
</table>
Grid No.2 to cathode ............ 2 2.1 4.1 pF
Cathode to heater ............ 2 2.5 4.1 pF

3. Grid-No.1 Voltage ............ 1.3 -19 -10 V

4. Interelectrode Leakage

Resistance ............ 4 50 – MΩ

5. Zero Bias Plate Current ............ 1.5 1.0 1.8 A

Note 1: With 13.5 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

Note 4: Under conditions 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 electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm, will be no less than the valve specified.

Note 5: With dc plate voltage of 450 volts, dc grid No.2 voltage of 400 volts, dc grid No.1 voltage of -100 volts, grid drive voltage to zero. With pulse duration of 4500 to 5000 μs and pulse repetition frequency is 10 to 12 pps.

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 a plate dissipation of 310 watts, approximately four and one half cubic feet of air per minute at an incoming temperature of 24° C is required in accordance with the air flow characteristics as shown in the chart.

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 RCA Transmitting Tube Operating Considerations at front of this section.
DIMENSIONAL OUTLINE

PLATE TERMINAL
CAP JEDEC No. CI-1

RADIATOR CORE
TEMPERATURE
MEASUREMENT
POINT

PLATE TERMINAL
(RADIATOR)

GRID-No.2 TERMINAL
CONTACT SURFACE
(RING)

CERAMIC
STIPPLED
REGION
NOTE 1

TABULATED DIMENSIONS*

<table>
<thead>
<tr>
<th>Description</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>1.625 ± .015</td>
<td>41.28 ± .38</td>
</tr>
<tr>
<td>B Dia.</td>
<td>1.426 ± .010</td>
<td>36.22 ± .25</td>
</tr>
<tr>
<td>C Dia.</td>
<td>0.687 ref.</td>
<td>17.45 ref.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>1.25 max.</td>
<td>31.75 max.</td>
</tr>
<tr>
<td>E</td>
<td>2.26 max.</td>
<td>57.40 max.</td>
</tr>
<tr>
<td>F</td>
<td>1.920 ± .065</td>
<td>48.8 ± 1.7</td>
</tr>
<tr>
<td>G</td>
<td>0.750 ± .040</td>
<td>19.0 ± 1.0</td>
</tr>
<tr>
<td>H</td>
<td>1.515 ± .045</td>
<td>38.5 ± 1.1</td>
</tr>
<tr>
<td>J</td>
<td>0.150 min.</td>
<td>3.81 min.</td>
</tr>
<tr>
<td>K</td>
<td>0.300 ± .020</td>
<td>7.62 ± .51</td>
</tr>
<tr>
<td>M</td>
<td>0.080 min.</td>
<td>2.03 min.</td>
</tr>
<tr>
<td>N</td>
<td>1.200 max.</td>
<td>30.48 max.</td>
</tr>
</tbody>
</table>

*Basic dimensions are in inches. Metric dimensions are in millimeters and are derived from the inch dimensions (1 inch = 25.4 mm).
NOTES FOR DIMENSIONAL OUTLINE

Note 1: Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Note 2: The diameters of the radiator, grid-No.2 ring terminal contact, and pin circle shall be concentric within the following values of the maximum full indicator reading:

- Radiator to Grid-No.2 Terminal Contact Surface: 0.030" max.
- Radiator to Pin Circle: 0.040" max.
- Grid-No.2 Terminal Contact Surface to Pin Circle: 0.030" max.

The full indicator reading is the deviation of a surface when the tube is rotated about the center of the reference. It is a measure of the total effect of run-out and ellipticity.

Note 3: Base conforms to specification of the Large Wafer, Eleven, Eleven pin with ring Base No.JEDEC No.E11-B1. It may be checked with Gauge JEDEC No.GE11-1.

TERMINAL DIAGRAM
(Bottom View)

- Pin 1: Cathode
- Pin 2: Grid No.2
- Pin 3: Grid No.1
- Pin 4: Cathode
- Pin 5: Heater
- Pin 6: Heater
- Pin 7: Grid No.2
- Pin 8: Grid No.1
- Pin 9: Cathode
- Pin 10: Grid No.2
- Pin 11: Grid No.1
- Cap: Plate Terminal
- Radiator: Plate Terminal
- Ring: Grid-No.2 Terminal Contact Surface (For use at higher frequencies)
TYPICAL CONSTANT — CURRENT CHARACTERISTICS

HEATER VOLTAGE = 13.5 V
GRID No. 2 VOLTS = 250 V
PLATE mA = I_b
GRID No. 2 mA = I_c2
GRID No. 1 mA = I_c1
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 13.5 V
GRID No. 2 VOLTS = 400 V
GRID No. 1 VOLTS = $E_{c1}$
TYPICAL GRID CHARACTERISTICS

HEATER VOLS: 13.5 V
GRID-No. 2 VOLS: 400 V
GRID-No. 1 VOLS: $E_C^1$
$I_{C_1}$
$I_{C_2}$

GRID-No. 2 MILLIAMPERES

PLATE VOLTS

Electronic Components
DATA 6
TYPICAL COOLING REQUIREMENTS

Air flow direct through radiator with air chimney (SK-606, #124-111-1*) socket* and by-pass capacitor.*

Plate-core temperature — 250° C.
Incoming-air temperature — 24° C.

#May be obtained through Eitel McCullough, Inc., San Carlos, CA 94070.
*May be obtained through EF Johnson, Co., 1921 10th Ave., SW, Waseca, MN 56093.
HALF-WAVE MERCURY-VAPOR RECTIFIER

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:  Min.  Av.  Max.
Voltage ........................................ 4.75  5.0  5.25 volts
Current at 5 volts ......................... 4.5  4.9 amp
Cathode:
Heating Time, before tube conduction .......... 5 minutes
Tube Voltage Drop ............................ 15 volts
Critical Anode Voltage ...................... 50 volts

Mechanical:
Mounting Position .......................... Vertical, Base Down
Maximum Overall Length: .................. 7"
Seated Length: ............................... 6-1/4" ± 1/4"
Maximum Diameter: ......................... 3"
Bulb: ........................................ Medium (JETEC No. C1-5)
Cap: .......................................... Medium-Shell Small 4-Pin, Bayonet
                                      (JETEC No. A4-10)
Base: ...........................................

Temperature Control:

Heating—When the ambient temperature is so low that
the normal rise of condensed-mercury temperature
above the ambient temperature will not bring the
condensed-mercury temperature up to the minimum
value of the operating ranges specified under
Maximum Ratings, some form of heat-conserving en-
closure or auxiliary heater will be required.

Cooling—When the operating conditions are such that the
maximum value of the operating condensed-mercury
temperature range is exceeded, provision should be
made for forced-air cooling sufficient to prevent
exceeding the maximum value.

Temperature Rise of Condensed Mercury
to Equilibrium Above Ambient
Temperature (Approx.):*

No Load ...................................... 22 °C
Full Load .................................... 28 °C

*With heater volts = 5.75 and no heat-conserving enclosure.
HALF-WAVE MERCURY-VAPOR RECTIFIER

Maximum Ratings, Absolute Values: Up to 150 cps

Operating Condensed-Mercury Temperature Range
30° to 80°C 30° to 80°C

PEAK INVERSE
ANODE VOLTAGE . . . . . . . . . . . . 2000 max. 5000 max. volts
CATHODE CURRENT:
Peak . . . . . . . . . . . . . . . . . . . . . 15 max. 15 max. amp
Average* . . . . . . . . . . . . . . . . . . 2.5 max. 2.5 max. amp
Fault, for duration
of 0.1 second max. 200 max. 200 max. amp

* Averaged over any interval of 15 seconds maximum.

ZONE WHERE CONDENSED-MERCURY TEMPERATURE SHOULD BE MEASURED

MEDIUM-SHELL SMALL 4-PIN BAYONET BASE JETEC N4A4-10

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

APRIL 1, 1953

HALF-WAVE RECTIFIER

MAXIMUM RATINGS, ABSOLUTE VALUES: UP TO 150 CPS

OPERATING CONDENSED-MERCURY TEMPERATURE RANGE
30° TO 80°C 30° TO 80°C

PEAK INVERSE
ANODE VOLTAGE . . . . . . . . . . . . 2000 MAX. 5000 MAX. VOLTS
CATHODE CURRENT:
Peak . . . . . . . . . . . . . . . . . . . . . 15 MAX. 15 MAX. AMP
Average* . . . . . . . . . . . . . . . . . . 2.5 MAX. 2.5 MAX. AMP
Fault, for duration
of 0.1 second max. 200 MAX. 200 MAX. AMP

* AVERAGED OVER ANY INTERVAL OF 15 SECONDS MAXIMUM.
RATE OF RISE OF COND.-MERCURY TEMPERATURE

$E_f = 4.75$ VOLTS RMS
NO LOAD
HALF-WAVE MERCURY-VAPOR RECTIFIER

**Electrical:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater, for Unipotential Cathode:</td>
<td></td>
</tr>
<tr>
<td>Voltage*</td>
<td>5 volts</td>
</tr>
<tr>
<td>Current</td>
<td>10 amp</td>
</tr>
<tr>
<td>Peak Voltage Drop (Approx.)</td>
<td>15 volts</td>
</tr>
</tbody>
</table>

**Mechanical:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting Position</td>
<td>Vertical, Base Down</td>
</tr>
<tr>
<td>Overall Length</td>
<td>17&quot; ± 1/4&quot;</td>
</tr>
<tr>
<td>Maximum Diameter</td>
<td>3-13/16&quot;</td>
</tr>
<tr>
<td>Bulb</td>
<td>ST-30</td>
</tr>
<tr>
<td>Cap</td>
<td>3917</td>
</tr>
<tr>
<td>Base</td>
<td>Large Metal-Shell Super-Jumbo 4-Pin, Bayonet</td>
</tr>
</tbody>
</table>

**Maximum Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAK INVERSE ANODE VOLTAGE:</td>
<td></td>
</tr>
<tr>
<td>Continuous Service</td>
<td>3000 max.</td>
</tr>
<tr>
<td>Welder-Control Service</td>
<td>10000 max.</td>
</tr>
<tr>
<td>INSTANTANEOUS ANODE CURRENT:</td>
<td></td>
</tr>
<tr>
<td>Below 25 Cycles</td>
<td>12.8 max.</td>
</tr>
<tr>
<td>25 Cycles and Higher</td>
<td>40 max.</td>
</tr>
<tr>
<td>AVERAGE ANODE CURRENT#</td>
<td>6.4 max.</td>
</tr>
<tr>
<td>SURGE ANODE CURRENT: for</td>
<td>4 max.</td>
</tr>
<tr>
<td>0.1 sec. max</td>
<td></td>
</tr>
<tr>
<td>COND.-MERCURY TEMP. RANGE#</td>
<td>40 - 80</td>
</tr>
<tr>
<td>°C</td>
<td>25 - 50</td>
</tr>
</tbody>
</table>

# Heater voltage must be applied at least 5 minutes before anode voltage is applied.

# Averaged over any 15-second interval.

° Recommended condensed-mercury temperature 40°C.

MAY 1, 1946

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HAIRSTOWN, NEW JERSEY

TENTATIVE DATA
## GENERAL DATA

### Electrical:
- **Filament, Multistrand Tungsten:**
  - Excitation: Single-Phase AC or DC
  - Voltage: 11 ac or dc volts
  - Current: 412 amp
- **Starting Current:** The filament current must never exceed 750 amperes, even momentarily.
- **Cold Resistance:** 0.0026 ohm
- **Amplification Factor:** 32
- **Direct Interelectrode Capacitances (Approx.):**
  - Grid to Plate: 35 μf
  - Grid to Filament: 76 μf
  - Plate to Filament: 1.2 μf

### Mechanical:
- **Terminal Connections:**
  - F - Filament Posts
  - G - Grid-Flange Terminal
  - P - Radiator-Cooled Plate Terminal
  - Diametrically opposite terminals must be connected together

- **Mounting Position:** Vertical, Filament end up
- **Maximum Overall Length:** 17-3/8”
- **Maximum Diameter:** 14-1/4”
- **Radiator:** Integral part of tube
- **Mounting:** Special

### Air Flow:
- **Through Radiator (for max. ratings):** 1100 min. cfm
- The specified air flow at a pressure of 2.4 inches of water should be delivered by a blower vertically upward through the radiator.
- Air flow should be started before the application of any voltages.
- **To Filament Seals:** 200 min. cfm
- The specified air flow from a duct 8 square inches in area directed into the filament header before and during the application of any voltages, is required to limit the temperature of the header and filament seals to the maximum value.

- **Input-Air Temperature (to radiator):** 45 max. °C
- **Radiator Temperature (measured in thermometer well):** 180 max. °C
- **Bulb Temperature:** 180 max. °C
- **Seal Temperature (filament, grid, plate):** 165 max. °C

### RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy
- Key-down conditions per tube without amplitude modulation.

### Maximum CCS® Ratings, Absolute Values:
- **DC PLATE VOLTAGE:** 11500 max. volts
- **DC GRID VOLTAGE:** -2000 max. volts
- **DC PLATE CURRENT:** 4.5 max. amp
- **DC GRID CURRENT:** 0.8 max. amp

---

**Notes:**
- See next page.

---

**April 15, 1947**

**TENTATIVE DATA**

**Tube Department**

RCA CORPORATION OF AMERICA, HARRISON, NEW JERSEY
5592
POWER TRIODE

| PLATE INPUT | 50 max. | kw |
| PLATE DISSIPATION | 17.5 max. | kw |

Typical Operation in Grounded-Filament Circuit:

- **DC Plate Voltage**: 7500 to 11000 volts
- **DC Grid Voltage**: -360 to -820 volts
- **Peak RF Grid Voltage**: 900 to 1450 volts
- **DC Plate Current**: 4.4 amp
- **DC Grid Current (Approx.)**: 0.6 amp
- **Driving Power (Approx.)**: 450 watts
- **Power Output (Approx.)**: 20 kw

Typical Operation as Amplifier in Grounded-Grid Circuit at 108 Mc:

- **DC Plate Voltage**: 7500 volts
- **DC Grid Voltage**: -1000 volts
- **Peak RF Grid Voltage**: 1550 volts
- **DC Plate Current**: 4.4 amp
- **DC Grid Current (Approx.)**: 0.6 amp
- **Driving Power (Approx.)**: 9000 watts
- **Power Output (Approx.)**: 27 kw

- Modulation essentially negative may be used if positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- Continuous Commercial Service.
- Obtained by grid-resistor (600, 1000), cathode-resistor (75, 200) or by partial self-bias methods.
- Subject to wide variations as explained on sheet TUBE RATINGS in General Section.
- For Class C Telegraphy or Class C FM Telephony.

Data on operating frequencies for the 5592 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.
POWER TRIODE

TOP VIEW

4 FILAMENT POSTS
.676" ± .010" DIA.
SEE NOTE

7.328"
± .015"
30° ± 5°
30° ± 5°
6 ⅔
MAX.
7 ¾"
± ⅛"

CLEARANCE HOLE
FOR #8 SCREW
(12 HOLES)
3 ⅛ DIA.

GRID TERMINAL
SEE NOTE

1 ⅛ APPROX.

PLATE
7 ¾"
MAX.

THERMOMETER
WELL
5 ⅛" DIA. 1 ½" DEEP

13 ⅞"
± ⅛"

17 ¾"
MAX.

10" ± ⅛"
11" ± ⅛"
14 ⅛ MAX.

AIR-COOLED
RADIATOR

NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.

92CM-6827

APRIL 15, 1947
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
CE-6827
AVERAGE FILAMENT CHARACTERISTIC

COLD RESISTANCE OF FILAMENT = 0.0026 OHM

FILAMENT VOLTS

FILAMENT AMPERES

440
420
400
380
360
340
320
7 8 9 10 11 12

FEB. 7, 1947
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
92CM-6639
VHF POWER PENTODE
MINIATURE TYPE

GENERAL DATA

Electrical:
Filament, Coated:

<table>
<thead>
<tr>
<th>Filament Arrangement</th>
<th>Series*</th>
<th>Parallel**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>6.0±10%</td>
<td>3.0±10% ac or dc volts</td>
</tr>
<tr>
<td>Current</td>
<td>0.23</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Direct Interelectrode Capacitances:

- Grid No.1 to Plate: 0.24 µf
- Input: 7.0 µf
- Output: 5.0 µf

* With no external shield.

Mechanical:
Mounting Position: Vertical, or Horizontal with pins No.1 & No.5 in a horizontal plane

- Maximum Overall Length: 2-5/8"
- Maximum Seated Length: 2-3/8"
- Length from Base Seat to Bulb Top (excluding tip): 2" ± 3/32"
- Maximum Diameter: 3/4"
- Bulb: T-5-1/2

Base: Small-Button Miniature 7-Pin Basing Designation for BOTTOM VIEW: 7CU

Pin 1—Filament (−) Pin 2—Plate Pin 3—Grid No.2 Pin 4—Grid No.3, Int. Shield Pin 5—Filament Mid-Tap Pin 6—Grid No.1 Pin 7—Filament (+)

AF POWER AMPLIFIER & MODULATOR—Class A1

Maximum ICAS** Ratings, Absolute Values:

- DC PLATE VOLTAGE: 300 max. volts
- DC GRID-No.2 (SCREEN) VOLTAGE: 125 max. volts
- GRID-No.2 INPUT: 2 max. watts
- PLATE DISSIPATION: 5 max. watts

Typical Operation:

<table>
<thead>
<tr>
<th>Filament Arrangement</th>
<th>Series*</th>
<th>Parallel**</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.3 Voltage</td>
<td>0°</td>
<td>0° volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>75</td>
<td>75 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>-8</td>
<td>-8 volts</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>8</td>
<td>8 volts</td>
</tr>
</tbody>
</table>

See next page.

OCTOBER 15, 1947
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Zero-Signal DC</th>
<th>Max.-Signal DC</th>
<th>Max.-Signal DC Grid-No.2</th>
<th>Transconductance</th>
<th>Effective Load Resistance</th>
<th>Total Harmonic Distortion</th>
<th>Max.-Signal Power Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Current</td>
<td>16 ma</td>
<td>19 ma</td>
<td>17.5 ma</td>
<td>3500 µhos</td>
<td>12000 ohms</td>
<td>10%</td>
<td>1.2 watts</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>1.5 ma</td>
<td>2.0 ma</td>
<td>3.5 ma</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Circuit Values:**

| Grid-No.1 - Circuit Resistance                | 5000 ohms min. | 100000 ohms max. |

**Radio Frequency Power Amplifier & Oscillator—Class C Telegraphy:**

**Maximum ICAS Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage (SCREEN) Voltage</td>
<td>125 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage (CONTROL-GRID) Voltage</td>
<td>-125 max. volts</td>
</tr>
<tr>
<td>DC Plate CURRENT</td>
<td>30 max. ma</td>
</tr>
<tr>
<td>DC Grid-No.1 CURRENT</td>
<td>3 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>7.5 max. watts</td>
</tr>
<tr>
<td>GRID-NO.2 INPUT</td>
<td>2 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>5 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 40 Mc</th>
<th>At 80 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 volts</td>
<td>300 volts</td>
</tr>
<tr>
<td>DC Grid-No.3 Voltage</td>
<td>0 volts</td>
<td>0 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>75 volts</td>
<td>75 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>32000 ohms</td>
<td>32000 ohms</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>65 volts</td>
<td>65 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>25 ma</td>
<td>25 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>7 ma</td>
<td>7 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.5 ma</td>
<td>1.5 ma</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.2 watt</td>
<td>0.3 watt</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>5.4 watts</td>
<td>5.2 watts</td>
</tr>
</tbody>
</table>

**Circuit Values:**

| Grid-No.1 - Circuit Resistance                | 5000 ohms min. | 100000 ohms max. |

* Useful power output is approximately 5.0 watts for 40 Mc and 4.5 watts for 80 Mc.
### Frequency Multiplier

Maximum ICAS Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 (Screen) Voltage</td>
<td>125 max. volts</td>
</tr>
<tr>
<td>DC Grid-No. 1 (Control-Grid) Voltage</td>
<td>-125 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>30 max. ma</td>
</tr>
<tr>
<td>DC Grid-No. 1 Current</td>
<td>3 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>7.5 max. watts</td>
</tr>
<tr>
<td>GRID-No. 2 INPUT</td>
<td>2 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>5 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation:**

- **Doubler**
  - to 80 Mc
  - DC Plate Voltage: 300 volts
  - DC Grid-No. 3 Voltage: 0 volts
  - DC Grid-No. 2 Voltage: 75 volts
  - DC Grid-No. 1 Voltage: 41000 ohms
  - Peak RF Grid-No. 1 Voltage: 160 volts
  - DC Plate Current: 25 ma
  - DC Grid-No. 2 Current: 5.5 ma
  - DC Grid-No. 1 Current (Approx.): 1.85 ma
  - Driving Power (Approx.): 0.75 watt
  - Power Output (Approx.): 4.2 watts

- **Tripler**
  - to 80 Mc
  - DC Plate Voltage: 300 volts
  - DC Grid-No. 3 Voltage: 0 volts
  - DC Grid-No. 2 Voltage: 75 volts
  - DC Grid-No. 1 Voltage: 41000 ohms
  - Peak RF Grid-No. 1 Voltage: 160 volts
  - DC Plate Current: 25 ma
  - DC Grid-No. 2 Current: 5.5 ma
  - DC Grid-No. 1 Current (Approx.): 1.85 ma
  - Driving Power (Approx.): 0.75 watt
  - Power Output (Approx.): 3.4 watts

**Circuit Values:**

- Grid-No. 1 Circuit Resistance: 5000 min. ohms; 100000 max. ohms

**Useful** power output is approximately 3.5 watts for doubler service and 2.7 watts for tripler operation.

For series filament arrangement, filament voltage is applied between pins No. 1 and No. 7. The grid-No. 1 voltage is referred to pin No. 1, and grid-No. 3 (pin No. 4) is connected to pin No. 1.

For parallel filament arrangement, filament voltage is applied between pin No. 5 and pins No. 1 and No. 7 connected together. The grid-No. 1 voltage is referred to pin No. 5 and grid-No. 3 (pin No. 4) is connected to pin No. 5.

Intermittent Commercial and Amateur Service.

For dc filament supply.

Obtained from a fixed supply or by a grid-No. 1 resistor (30000) or cathode resistor (1400).

Obtained from a separate source, or from the plate voltage supply with a voltage divider. Series screen resistor of value shown should be used only where the 5618 is employed as a buffer amplifier and is not keyed.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 15% of the carrier conditions.

Filament may be connected in either parallel or series arrangement. With parallel connection, grid-No. 3 (pin No. 4) is connected to pin No. 5; for series operation, connect pin No. 4 to pin No. 1.

Obtained from a fixed supply, or by a grid-No. 1 resistor of value shown.

---

**OCTOBER 15, 1947**

TUBE DEPARTMENT

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, MARRIOTON, NEW JERSEY
Power Triode

**FORCED-AIR COOLED**

**GENERAL DATA**

**Electrical:**
- Filament, Multistrand Thoriated Tungsten:
  - Excitation: Single-Phase AC or DC
  - Voltage: 11 ± 5% volts
- Current at heater volts = 11: 285 amp
- Minimum heating time: 15 sec
- Amplification Factor for grid volts = -50, plate amperes = 2: 40

**Direct Interelectrode Capacitances (Approx.):**
- Grid to plate: 50 μF
- Grid to filament: 90 μF
- Plate to filament: 1.5 μF

**Mechanical:**
- Operating Position: Vertical, filament end up
- Maximum Overall Length: 25"
- Maximum Diameter: 17"
- Weight (Approx.): 228 pounds

**Radiator:** Integral part of tube

**Air Jacket:** RCA-241F1

**Thermal:**

**Air Flow:**

*Through radiator*—The specified air flow for various plate dissipations as indicated below should be delivered by a blower vertically upward through the radiator before and during the application of any voltages. Filament power, plate power, and air may be removed simultaneously.

- **Plate Dissipation:** 15 20 25 kw
- **Air Flow:** 1100 1450 1800 cfm
- **Static Pressure:** 0.85 1.5 2.2 in. of water

To filament seals: 10 min. cfm

The specified air flow should be directed from a 1-1/4"-diameter nozzle into the filament header before and during the application of any voltages to limit the temperature of the filament seals to the maximum value.

**Indicates a change.**
Input Air Temperature (To radiator) 45 max. °C
Radiator Temperature. 180 max. °C
Bulb Temperature. 180 max. °C
Seal Temperature (Filament, grid, and plate). 165 max. °C

AF POWER AMPLIFIER and MODULATOR — Class B

Maximum CCS^b Ratings, Absolute-Maximum Values:
DC PLATE VOLTAGE. 15000 max. volts
MAX.-SIGNAL DC PLATE CURRENT^c 6 max. amp
MAX.-SIGNAL PLATE INPUT^e 90 max. kw
PLATE DISSIPATION^e 25 max. kw

Typical Operation:
Values are for 4 tubes:
Filament Voltage. 10 11 volts
DC Plate Voltage. 10200 15000 volts
DC Grid Voltage. -220 -320 volts
Peak AF Grid-to-Grid Voltage. 900 1600 volts
Zero-Signal DC Plate Current. 0.6 0.6 amp
Max.-Signal DC Plate Current. 5.8 10 amp
Effective Load Resistance (Plate to plate). 3600 3320 ohms
Max.-Signal Driving Power (Approx.)^d 120 600 watts
Max.-Signal Power Output (Approx.). 37 100 kw

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a max. modulation factor of 1

Maximum CCS^b Ratings, Absolute-Maximum Values:
DC PLATE VOLTAGE. 12500 max. volts
DC GRID VOLTAGE. -2000 max. volts
DC PLATE CURRENT. 4.5 max. amp
DC GRID CURRENT. 1 max. amp
PLATE INPUT. 55 max. kw
PLATE DISSIPATION. 17 max. kw

Typical Operation:
Filament Voltage. 10 11 volts
DC Plate Voltage. 10200 12500 volts
DC Grid Voltage:
From a fixed supply of. -1500 -1500 volts
From a grid resistor of 2100 1500 ohms
Peak RF Grid Voltage. 2070 2180 volts
DC Plate Current. 3.3 4 amp
DC Grid Current (Approx.) 0.72 1 amp
Driving Power (Approx.) 1350 1360 watts
Power Output (Approx.). 28 40 kw

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.
RF POWER AMPLIFIER and OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without modulation

Maximum CCS\textsuperscript{b} Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>15000</td>
<td>max.</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-2000</td>
<td>max.</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>8 max.</td>
<td></td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>1 max.</td>
<td></td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>100 max.</td>
<td>kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>25 max.</td>
<td>kw</td>
</tr>
</tbody>
</table>

Typical Operation:

At 1.6 kc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Voltage</td>
<td>10</td>
<td>11 volts</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>12500</td>
<td>15000</td>
</tr>
<tr>
<td>DC Grid Voltage\textsuperscript{h}</td>
<td>-1250</td>
<td>-1500</td>
</tr>
<tr>
<td>From a fixed supply of.</td>
<td>190</td>
<td>225 ohms</td>
</tr>
<tr>
<td>From a cathode resistor of.</td>
<td>1300</td>
<td>1500 ohms</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>1970</td>
<td>2270</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>5.8</td>
<td>6 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.95</td>
<td>1 amp</td>
</tr>
<tr>
<td>Driving Power (Approx.)\textsuperscript{f}</td>
<td>1700</td>
<td>2040 watts</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>55</td>
<td>70 kw</td>
</tr>
</tbody>
</table>

\textsuperscript{a} When the 5671 is operated at less than maximum ratings, the filament voltage may be reduced to 9.75 volts.

\textsuperscript{b} CCS Continuous Commercial Service.

\textsuperscript{c} Averaged over any audio-frequency cycle of sine-wave form.

\textsuperscript{d} The driving stage should have good regulation and should be capable of supplying considerably more than the required driving power.

\textsuperscript{e} Obtained from a fixed supply, grid resistor, or a combination of both.

\textsuperscript{f} Low Frequency driving power is absorbed by the grid end grid resistor and does not include circuit losses. At higher frequencies the power furnished by the driver must be greater because of increased tube and circuit losses.

\textsuperscript{g} Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115\% of the carrier conditions.

\textsuperscript{h} Obtained from a fixed supply, cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>265</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1,2</td>
<td>35</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>45</td>
<td>59</td>
</tr>
<tr>
<td>Grid to filament</td>
<td>72</td>
<td>104</td>
</tr>
<tr>
<td>Plate to filament</td>
<td>1.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1,3</td>
<td>3200</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1,4</td>
<td>6700</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>1,5</td>
<td>-310</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>1,6</td>
<td>-1100</td>
</tr>
</tbody>
</table>

\textsuperscript{Note} min. = minimum, max. = maximum

\textsuperscript{Indicates a change.}
Peak Cathode Current: 7 amp
Grid Current: 1.6 - 9.5 amp
Useful Power Output: 1.8 - 59 kw

Note 1: With 11 volts ac on filament.
Note 2: With dc grid voltage of -50 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.
Note 3: With dc grid voltage of 0 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.
Note 4: With dc grid voltage of -100 volts and dc plate voltage adjusted to give dc plate current of 2 amperes.
Note 5: With dc plate voltage of 15000 volts and dc grid voltage adjusted to give dc plate current of 50 ma.
Note 6: With dc plate voltage of 2600 volts and instantaneous grid voltage adjusted to give instantaneous plate current of 35 amperes.
Note 7: Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.
Note 8: In self-excited oscillator circuit and with dc plate voltage of 15000 volts, dc plate current of 6.6 amperes, dc grid current of 0.8 to 1.0 ampere, grid resistor of 1600 ± 10% ohms, and frequency of 1.6 Mc.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>10</th>
<th>18</th>
<th>25</th>
<th>Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM RATED PLATE VOLTAGE AND INPUT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C Telephony (Plate-Modulated)</td>
<td>100</td>
<td>88</td>
<td>80</td>
<td>%</td>
</tr>
<tr>
<td>Class C Telegraphy</td>
<td>100</td>
<td>88</td>
<td>80</td>
<td>%</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.
TYPICAL PLATE CHARACTERISTICS

$E_1 = 11 \text{ VOLTS AC}$

PLATE AMPERES

PLATE VOLTS ($E_p$)

RADIO CORPORATION OF AMERICA
Electron Tube Division  Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

$E_C = 11$ VOLTS AC
$I_C = \text{GRID AMPERES}
$I_B = \text{PLATE AMPERES}$
Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME       STURDY COAXIAL-ELECTRODE STRUCTURE

For Cathode-Drive Applications with Full Input
up to 1700 Mc and with Reduced Input up to
3000 Mc, and at Altitudes up to 100,000 Feet

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC).................. 6.3 ± 10% volts
Current at heater volts = 6.3...... 0.135 amp
Amplification Factor............... 20
Transconductance, for dc plate ma. = 24,
dc plate volts = 135................ 6200 μmhos
Direct Interelectrode Capacitances:
  Grid to plate..................... 1.4 pf
  Grid to cathode................... 2.4 pf
  Plate to cathode.................. 0.09 max. pf

Mechanical:
Operating Position................ Any
Dimensions........................ See Dimensional Outline
Socket for Heater Pins.............. Grayhill No.22-3b,
                                  Cinch 54A16325c,
or equivalent

Terminal Connections (See Dimensional Outline):

H - Heater
K - Cathode
G - Grid
P - Plate

Thermal:
Plate-Seal Temperature............. 175 max. °C

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without amplitude modulation

Maximum CCS° Ratings, Absolute-Maximum Values:
  For altitudes up to 100,000 feet
  and frequencies up to 1700 Mc

DC PLATE VOLTAGE.................. 300 max. volts
DC GRID VOLTAGE................... -90 max. volts
DC CATHODE CURRENT................ 30 max. ma

→ Indicates a change.
DC GRID CURRENT: 8 max. ma
PLATE INPUT: 5 max. watts
PLATE DISSIPATION: 5 max. watts
PEAK HEATER-CATHODE VOLTAGE:
  Heater negative with respect to cathode: 90 max. volts
  Heater positive with respect to cathode: 90 max. volts

Typical CCS° Operation:
As an oscillator in cathode-drive circuit

At frequency of 1700 3000 Mc
DC Plate-to-Grid Voltage: 128 151.5 volts
DC Cathode-to-Grid Voltage: 8 1.5 volts
  From a grid resistor of 2000 5000 ohms
DC Plate Current: 25 29 ma
DC Grid Current (Approx.): 4 0.3 ma
Useful Power Output (Approx.): 475 50 mw

Maximum Circuit Values:
Grid-Circuit Resistance: 0.1 max. megohm

Without external shield.

As oscillator in cathode-drive circuit

Heater Current: 1 0.125 0.145 amp

Direct Interelectrode Capacitances:
  Grid to plate: 1.2 1.6 pf
  Grid to cathode: 2.0 2.6 pf
  Plate to cathode: 0.09 pf

Heater-Cathode Leakage Current:
  Heater negative with respect to cathode: 1.2 - 100 μa
  Heater positive with respect to cathode: 1.2 - 100 μa

Leakage Resistance:
  From grid to plate and cathode connected together: 1.3 25 - megohms
  From plate to grid and cathode connected together: 1.4 25 - megohms

Reverse Grid Current: 1.5 - 1 μa
Emission Voltage: 6 - 14 volts
Amplification Factor: 1.7 15 25
Transconductance: 1.7 5100 7700 μmhos

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
SPECIAL TESTS AND PERFORMANCE DATA

Low-Frequency Vibration Performance:
This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.3 volts, dc plate supply voltage of 150 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cps at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:
This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes every 90 days. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will meet the following limits:

Heater-Cathode Leakage Current. . . . . 100 max. μA
For conditions shown under Characteristics Range Values Notes 1, 2.

Low-Frequency Vibration (rms). . . . . 100 max. mV
For conditions shown above under Low-Frequency Vibration Performance.

Transconductance. . . . . . . . . . . . . 5100 min. μmhos
For conditions shown under Characteristics Range Values Notes 1, 7.

Plate Current (2) . . . . . . . . . . . . 100 max. μA
For conditions shown under Characteristics Range Values Notes 1, 8.
Shorts and Continuity Test:

This test (similar to MIL-E-1D, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-1D, Amendment 5.

Glass Seal Fracture Tests:

Fracture tests are performed on a sample lot of tubes every 90 days.

1. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to the tube axis, of a force of 50 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes are held by clamping to the cathode cylinder. Tubes will withstand gradual application of a torque of 12.5 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is lifetime tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.3 volts, plate-supply voltage of 300 volts, cathode resistor is adjusted to give a dc plate current of 30 ma and value is recorded. At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limit:

Power Output: . . . . . . . . . . . . . . . . . . . . . . 0.2 min. watt
For conditions shown under Characteristics Range Values
Notes 1,9.

OPERATING CONSIDERATIONS

The mounting for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The mounting for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.
The heater pins of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values.

NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.010".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.020".
$E_C = 6.3 \text{ VOLTS}$

PLATE ($I_B$) OR GRID ($I_C$) MILLIAMPERES

PLATE VOLTS

92CM-7343

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Power Triode

VHF GRID-DRIVE OR CATHODE-DRIVE OPERATION

INTEGRAL RADIATOR
4000 WATTS CW OUTPUT AT 220 Mc/s
FORCED-AIR COOLED
7000 WATTS CW OUTPUT AT 30 Mc/s
THORIATED-TUNGSTEN
6350 WATTS VHF TV OUTPUT
FILAMENT AT 216 Mc/s

For Use In VHF Television and CW Service in Stationary and Portable Equipment

ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Type
Voltage (AC or DC) ........................................ 12.6 typ V
Current:
Typical value at 12.6 volts .............................. 29 A
For starting, even momentarily ......................... 175 max A
Cold Resistance ............................................. 0.052 Ω
Heating Time .................................................. 15 min
Amplification Factor ....................................... 29
Direct Interelectrode Capacitances
Grid to plate .................................................. 18 pF
Grid to filament ............................................. 19 pF
Plate to filament ............................................ 0.5 pF

MECHANICAL

Operating Position ........................................ Vertical, either end up
Maximum Overall Length ................................ 7.12 in
Maximum Diameter (See Dimensional Outline) ........ 4.68 in
Weight (Approx.) ............................................ 6-1/4 lbs
Radiator ......................................................... Integral part of tube
Terminal Connections (See Dimensional Outline)

Air Flow
Through Radiator—Adequate air flow to limit the plate-core temperature to 180°C should be delivered by a blower through the radiator before and during the application of all voltages. The flow of incoming air at temperatures up to 45°C are given for various plate dissipations indicated in the following tabulation.
Percentage of maximum rated plate dissipation for each class of service... 100 80 60 per cent
Minimum air flow... 300 214 125 cfm
Static pressure... 2.9 1.47 0.58 in of water
To grid and filament terminals... 10 min cfm

The specified air flow from a 1"-diameter nozzle should be directed into the filament header before and during the application of any voltages in order to limit the temperature of the filament and grid terminals to the specified maximum value.

During standby operation—Cooling air is required when heater voltage is applied to the tube.

Terminal Temperature (Filament, grid, and plate)... 180 max °C
Plate Core Temperature (See Dimensional Outline)... 180 max °C
Bulb Temperature (At hottest part)... 180 max °C

AF POWER AMPLIFIER & MODULATOR — CLASS BJ

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>Max.-Signal DC Plate Current</th>
<th>Max.-Signal Plate Input</th>
<th>Plate Dissipation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6200 V</td>
<td>1.5 A</td>
<td>8700 W</td>
<td>4000 W</td>
</tr>
</tbody>
</table>

Typical Operation Values are for 2 tubes

DC Plate Voltage... 4700 V
DC Grid Voltage... -200 V
Peak AF Grid-to-Grid Voltage... 900 V
Zero-Signal DC Plate Current... 0.3 A
Max.-Signal DC Plate Current... 2.8 A
Effective Load Resistance (Plate to plate)... 3640 Ω
Max.-Signal Driving Power (Approx.)... 195 W
Max.-Signal Power Output (Approx.)... 8800 W

RF POWER AMPLIFIER — CLASS B TELEVISION SERVICE^{j}

Synchronizing-level conditions per tube unless otherwise specified at frequency of 54 to 216 Mc/s

Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid Current (Pedestal level)</th>
<th>Plate Input</th>
<th>Plate Dissipation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4500 V</td>
<td>2 A</td>
<td>0.325 A</td>
<td>9000 W</td>
<td>4000 W</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit

Bandwidth of 10 8.5 6 Mc/s

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>DC Grid Voltage</th>
<th>Peak RF Grid Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3000 V</td>
<td>-105 V</td>
<td>380 V</td>
</tr>
<tr>
<td>3200 V</td>
<td>-110 V</td>
<td>435 V</td>
</tr>
<tr>
<td>4300 V</td>
<td>-150 V</td>
<td>500 V</td>
</tr>
</tbody>
</table>

Synchronizing level... 380 435 500 V
Pedestal level... 280 310 355 V

→ Indicates a change.
GRID-MODULATED RF POWER AMPLIFIER

CLASS C TELEVISION SERVICE

Synchronizing-level conditions per tube unless otherwise specified. At frequency of 54 to 216 Mc/s

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage ... 3700 V
DC Grid Voltage (White level). ... -800 V
DC Plate Current ... 1.9 A
DC Grid Current (Pedestal level) ... 0.225 A
Plate Input ... 6500 W
Plate Dissipation ... 4000 W

Typical Operation in Cathode-Drive Circuit

Bandwidth of 8.5 Mc/s

DC Plate Voltage ... 3200 V
DC Grid Voltage
Synchronizing level ... -110 V
Pedestal level ... -220 V
White level ... -520 V
Peak RF Grid Voltage ... 435 V
DC Plate Current
Synchronizing level ... 1.8 A
Pedestal level ... 1.25 A
DC Grid Current (Approx.)
Synchronizing level ... 0.400 A
Pedestal level ... 0.130 A
Driving Power (Approx.)
Synchronizing level ... 770 W
Power Output (Approx.)
Synchronizing level ... 4000 W
Pedestal level ... 2300 W

PLATE-MODULATED RF POWER AMPLIFIER — CLASS C TELEPHONY

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS Ratings, Absolute-Maximum Values

DC Plate Voltage ... 5000 V
DC Grid Voltage ... -1000 V
DC Plate Current ... 1 A
DC Grid Current ... 0.3 A
Plate Input ... 5000 W
Plate Dissipation ... 2700 W

RADIO CORPORATION OF AMERICA

Electronic Components and Devices
Harrison, N. J.
Typical Operation in Grid-Drive Circuit

<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>At 110 Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>4700</td>
<td>4000</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-400</td>
<td>-350</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>1425</td>
<td>1460</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>675</td>
<td>600</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.96</td>
<td>0.93</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.28</td>
<td>0.24</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>170</td>
<td>130</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>3700</td>
<td>2800</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit

<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>At 110 Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>4700</td>
<td>4000</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-400</td>
<td>-350</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>1425</td>
<td>1460</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>675</td>
<td>600</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.96</td>
<td>0.93</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.28</td>
<td>0.24</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>720</td>
<td>600</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>4200</td>
<td>3200</td>
</tr>
</tbody>
</table>

RF POWER AMPLIFIER & OSCILLATOR — CLASS C TELEGRAPHY
AND
RF POWER AMPLIFIER — CLASS C FM TELEPHONY

Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>At 110 Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6200</td>
<td>V</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-1000</td>
<td>V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.4</td>
<td>A</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>0.3</td>
<td>A</td>
</tr>
<tr>
<td>Plate Current</td>
<td>8700</td>
<td>W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>4000</td>
<td>W</td>
</tr>
</tbody>
</table>

Typical Operation in Grid-Drive Circuit

<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6000</td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-550</td>
<td>V</td>
</tr>
<tr>
<td>From a fixed supply of</td>
<td>1900</td>
<td></td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>875</td>
<td></td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.290</td>
<td>W</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>225</td>
<td></td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>6000</td>
<td>W</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit

<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>At 110 Mc/s</th>
<th>At 220 Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6000</td>
<td>5000</td>
<td>4800</td>
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</table>

— Indicates a change.
<table>
<thead>
<tr>
<th></th>
<th>Up to 30 Mc/s</th>
<th>At 110 Mc/s</th>
<th>At 220 Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a fixed supply of</td>
<td>-550</td>
<td>-1000</td>
<td>-200 V</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>1900</td>
<td>4100</td>
<td>807 Ω</td>
</tr>
<tr>
<td>From a cathode resistor of</td>
<td>360</td>
<td>740</td>
<td>134 Ω</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>875</td>
<td>1350</td>
<td>432 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.25 A</td>
<td>1.1</td>
<td>1.25 A</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.290</td>
<td>0.245</td>
<td>0.25 A</td>
</tr>
<tr>
<td>Driving Output (Approx.)</td>
<td>1225</td>
<td>1680</td>
<td>542 W</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>7000</td>
<td>5500</td>
<td>4000 W</td>
</tr>
</tbody>
</table>

**SELF-RECTIFYING OSCILLATOR OR AMPLIFIER — CLASS C^j**

Maximium CCS Ratings, Absolute-Maximum Values

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Plate Voltage (RMS)</td>
<td>7000 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate Input^c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Operation**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Plate Voltage (RMS)</td>
<td>6600 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving Output (Approx.)</td>
<td>60 W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>3350 W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AMPLIFIER OR OSCILLATOR — CLASS C^j**

With separate, rectified, unfiltered, single-phase, full-wave plate supply

Maximium CCS Ratings, Absolute-Maximum Values

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5600 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate Input^e</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Operation**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5000 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving Output (Approx.)</td>
<td>150 W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>5650 W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

^a Driver modulated approximately 30%.
^b Carrier power of driver modulated 100%.
^c Plate input is 1.11 times the product of the ac voltage (rms) and the dc plate current.
^d From a self-rectified driver.

---

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices

Harrison, N. J.
Plate input is 1.23 times the product of the dc plate voltage and the dc plate current.

From a driver with a rectified, unfiltered, single-phase, full-wave plate supply.

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

See Electrical Considerations-Filament or Heater.

See Cooling Considerations-Forced-Air Cooling.

See Classes of Service.

### RATINGS VS FREQUENCY

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>30</th>
<th>110</th>
<th>220</th>
<th>Mc/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Perm. % of Max. Rated Plate Voltage and Plate Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B Television Service</td>
<td>Full Ratings—54 to 216 Mc/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C Television Service</td>
<td>Full Ratings—54 to 216 Mc/s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C Telephony, Plate-Modulated</td>
<td>100</td>
<td>84</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>Class C Telegraphy and FM Telephony</td>
<td>100</td>
<td>84</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>Class C Amplifier or Oscillator, Self-Rectifying</td>
<td>100</td>
<td>84</td>
<td>72</td>
<td>%</td>
</tr>
<tr>
<td>Class C Amplifier or Oscillator with Separate, Rectified, Unfiltered Plate Supply</td>
<td>100</td>
<td>84</td>
<td>72</td>
<td>%</td>
</tr>
</tbody>
</table>

| Max. Perm. % of Max. Rated DC Grid Voltage and DC Grid Current | | | | |
| Class B Television Service | Full Ratings—54 to 216 Mc/s | | | |
| Class C Television Service | Full Ratings—54 to 216 Mc/s | | | |
| Class C Telephony, Plate-Modulated | 100 | 60 | 83 | % |
| Class C Telegraphy and FM Telephony | 100 | 60 | 83 | % |
| Class C Amplifier or Oscillator, Self-Rectifying | 100 | 60 | 83 | % |
| Class C Amplifier or Oscillator with Separate, Rectified, Unfiltered Plate Supply | 100 | 60 | 83 | % |

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>27</td>
<td>34</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.2</td>
<td>25</td>
<td>33</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>-</td>
<td>16.5</td>
<td>20.5</td>
</tr>
<tr>
<td>Grid to filament</td>
<td>-</td>
<td>15.5</td>
<td>22.5</td>
</tr>
<tr>
<td>Plate to filament</td>
<td>-</td>
<td>0.38</td>
<td>0.62</td>
</tr>
</tbody>
</table>

*Indicates a change.*
### Grid Voltage
- **Note 1:** With 12.6 volts rms on filament.
- **Note 2:** With dc grid voltage of -25 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.
- **Note 3:** With dc plate voltage of 4000 volts, and dc grid voltage adjusted to give dc plate current of 0.5 ampere.

<table>
<thead>
<tr>
<th>Grid Voltage</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3</td>
<td>-125</td>
<td>-190</td>
</tr>
</tbody>
</table>

### Plate Voltage
- **Note 3:** With dc grid voltage of 0 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.
- **Note 5:** With dc grid voltage of -50 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.
- **Note 6:** In a self-excited, coaxial, oscillator circuit and with dc plate voltage of 5000 volts, dc plate current of 1.1 amperes, grid resistor of 1500 ± 10% ohms, dc grid current of 0.250 to 0.300 amperes, and frequency of 110 MHz.

<table>
<thead>
<tr>
<th>Plate Voltage</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4</td>
<td>1350</td>
<td>1750</td>
</tr>
<tr>
<td>1.5</td>
<td>2600</td>
<td>3400</td>
</tr>
</tbody>
</table>

### Useful Power Output
- **Note 4:** With dc grid voltage of 0 volts measured from center-tap of filament supply, and dc plate voltage adjusted to give dc plate current of 0.5 ampere.

<table>
<thead>
<tr>
<th>Useful Power Output</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>3</td>
<td>kW</td>
</tr>
</tbody>
</table>
DIMENSIONAL OUTLINE

DIMENSIONS IN INCHES

- Temperature Measurement Point.

Note: Plane of filament leads will not deviate more than 3-1/2° from plane passing through AA\(^1\) normal to grid flange.

DATA 4
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
For each class of service, the percentage of maximum-rated plate dissipation increases as the radiator temperature rises. Air flow at temperatures up to 45°C through the radiator in the direction toward the filament end is crucial. Typical cooling characteristics of the radiator are shown in the diagram.
Typical Constant-Current Characteristics

\[ E_f = 12.6 \text{ VOLTS AC} \]
\[ I_c = \text{GRID AMPERES} \]
\[ I_b = \text{PLATE AMPERES} \]
5763
VHF BEAM POWER TUBE
9-PIN MINIATURE TYPE

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage ....... 6.0 ± 10% ... ac or dc volts
Current .......... 0.75 ... amp
Transconductance for plate
current of 45 ma .... 7000 .... μmhos
Mu-Factor, Grid No.2
to Grid No.1 .... 16
Direct Inter-electrode Capacitances:
Grid No.1 to Plate ... 0.3 max. .... μμf
Input ............. 9.5 .... μμf
Output .......... 4.5 .... μμf

With no external shield.

Mechanical:
Mounting Position .... Any
Maximum Overall Length .... 2-5/8"
Maximum Seated Length .... 2-3/8"
Length, Base Seat to Bulb Top (excluding tip) .... 2" ± 3/32"
Maximum Diameter .... 7/8"
Bulb .... T-6-1/2
Base .... Small-Button Naval 9-Pin (JEDEC No. E9-1)
Basing Designation for BOTTOM VIEW ..... 9K
Pin 1 - Plate .... Pin 2 - No Connection
Pin 3 - Grid No.3 .... Pin 4 - Heater
Pin 5 - Heater .... Pin 6 - Grid No.2
Pin 7 - Cathode .... Pin 8 - Grid No.1
Pin 9 - Grid No.1

PLATE-MODULATED RF POWER AMPLIFIER—Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum Ratings, Absolute Values:
DC PLATE VOLTAGE .... 250 max. ..... 300 max. volts
DC GRID-No.3 (SUPPRESSOR) VOLTAGE .... 0 max. ..... 0 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE .... 250 max. ..... 250 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE .... -125 max. ..... -125 max. volts
DC PLATE CURRENT .... 40 max. ..... 50 max. ma
DC GRID-No.2 CURRENT .... 15 max. ..... 15 max. ma
DC GRID-No.1 CURRENT .... 5 max. ..... 5 max. ma
PLATE INPUT .... 10 max. ..... 15 max. watts
GRID-No.2 INPUT .... 1.5 max. ..... 1.5 max. watts
PLATE DISSIPATION .... 8 max. ..... 12 max. watts

*See next page.

MAY 3, 1954
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

5763
# VHF Beam Power Tube

## Typical Operation up to 30 Mc:

<table>
<thead>
<tr>
<th>Component</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>Connected to cathode at socket</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage*</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage*</td>
<td>39</td>
<td>42.5</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>46.5</td>
<td>53.5</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5.6</td>
<td>6</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>1</td>
<td>2.4</td>
</tr>
</tbody>
</table>

### Maximum Circuit Values (CCS or ICAS Conditions):

<table>
<thead>
<tr>
<th>Component</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance</td>
<td>0.1</td>
<td>megohm</td>
</tr>
</tbody>
</table>

## RF Power Amplifier & Oscillator—Class C Telegraphy

and

## RF Power Amplifier—Class C FM Telephony

### Maximum Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Component</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>DC GRID-No.3 (SUPPRESSOR) VOLTAGE</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-125</td>
<td>-125</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>DC GRID-No.2 CURRENT</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>15</td>
<td>17</td>
</tr>
</tbody>
</table>

- Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.
- Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
- Key down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

See next page.

MAY 3, 1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
**VHF BEAM POWER TUBE**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.2 Input</td>
<td>2 max.</td>
<td>2 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>12 max.</td>
<td>13.5 max.</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>100 max.</td>
<td>100 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>100 max.</td>
<td>100 max.</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>250 max.</td>
<td>250 max.</td>
</tr>
</tbody>
</table>

**Typical Operation up to 30 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>Connected to cathode at socket</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-28.5 volts</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>18000 ohms</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>37.5 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>6.6 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>1.6 ma</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.1 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>10.3 watts</td>
</tr>
</tbody>
</table>

**Typical Operation at 50 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>Connected to cathode at socket</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-60 volts</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>22000 ohms</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>80 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>3 ma</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.35 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>7 watts</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values (CCS or ICAS Conditions):**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance</td>
<td>0.1 max. megohm</td>
</tr>
</tbody>
</table>

**Maximum CCS Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.3 (Suppressor) Voltage</td>
<td>0 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 (Screen) Voltage</td>
<td>250 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>-125 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 max. ma</td>
</tr>
</tbody>
</table>

* Continuous Commercial Service.
** Intermittent Commercial and Amateur Service.

---

**FREQUENCY MULTIPLIER**

**Maximum CCS Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.3 (Suppressor) Voltage</td>
<td>0 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 (Screen) Voltage</td>
<td>250 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>-125 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 max. ma</td>
</tr>
</tbody>
</table>

* Continuous Commercial Service.
** Intermittent Commercial and Amateur Service.

---

MAY 3, 1954
### DC Grid-No.2 Current
15 max. ma

### DC Grid-No.1 Current
5 max. ma

### Plate Input
15 max. watts

### Grid-No.2 Input
2 max. watts

### Plate Dissipation
12 max. watts

**Peak Heater-Cathode Voltage:**
- Heater negative with respect to cathode: 100 max. volts
- Heater positive with respect to cathode: 100 max. volts

**Bulb Temperature (At hottest point on bulb surface):** 250 max. °C

### Typical Operation:

<table>
<thead>
<tr>
<th></th>
<th>Doubler</th>
<th>Tripler</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>Connected to cathode at socket</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-75</td>
<td>-100</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>75000</td>
<td>100000</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>95</td>
<td>120</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1</td>
<td>1 max.</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.6</td>
<td>0.6 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>2.1</td>
<td>1.3 watt</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values (For maximum rated conditions):**
- Grid-No.1 Circuit Resistance: 0.1 max. megohm

### Characteristics Range Values for Equipment Design

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.69</td>
<td>0.81</td>
</tr>
<tr>
<td>Grid-No.1-Plate Capacitance</td>
<td>2</td>
<td>-</td>
<td>0.3  µf</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>2</td>
<td>8.0</td>
<td>11.0 µf</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>2</td>
<td>3.8</td>
<td>5.2  µf</td>
</tr>
<tr>
<td>Transconductance</td>
<td>1.3</td>
<td>5100</td>
<td>8900 µmhos</td>
</tr>
<tr>
<td>Plate Current</td>
<td>1.3</td>
<td>33</td>
<td>57   ma</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>1.3</td>
<td>-</td>
<td>10   ma</td>
</tr>
<tr>
<td>Reverse Grid-No.1 Current</td>
<td>1.4</td>
<td>-</td>
<td>2    µmamp</td>
</tr>
</tbody>
</table>

**Note 1:** With 6 volts ac or dc on heater.

**Note 2:** With no external shield.

**Note 3:** With dc plate voltage of 250 volts, dc grid-no.2 voltage of 250 volts, and dc grid-no.1 voltage of -7.5 volts.

**Note 4:** With dc plate voltage of 250 volts, dc grid-no.2 voltage of 250 volts, dc grid-no.1 voltage of -7.5 volts, and grid-no.1 circuit resistance of 0.1 megohm.

- Obtained from a fixed supply, or by a grid-no.1 resistor of value shown.
- This value of useful power is measured at load of output circuit.

Data on Operating Frequencies for the 5763 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

Indicates a change
E<sub>φ</sub> = 6.0 VOLTS DC
GRID No. 2 VOLTS = 250
GRID No. 3 VOLTS = 0
AVERAGE PLATE CHARACTERISTICS
WITH EC2 AS VARIABLE

\( E_f = 6.0 \text{ VOLTS DC} \)
GRID-N01 VOLTS=0
GRID-N03 VOLTS=0

PLATE MILLIAMPERES

JAN. 10, 1949
TUBE DEPARTMENT
RCA CORPORATION OF AMERICA, HARRISON, N. J.
**Power Triode**

**WATER AND FORCED-AIR COOLED**

**GROUNDED-GRID TYPE**

**GENERAL DATA**

**Electrical:**
- Filament, Multistrand Thoriated-Tungsten:
  - Voltage (AC or DC): 11 ± 0.6 volts
  - Current at filament volts = 11: 285 amp
- Starting Current: it is not necessary to provide means for limiting filament starting current on this type. Full rated filament voltage can be applied safely to the cold filament.
- Minimum Heating Time: 15 sec
- Amplitude Factor: 40
- Direct Interelectrode Capacitances (Approx.):
  - Grid to plate: 53 pf
  - Grid to filament: 89 pf
  - Plate to filament: 12 pf

**Mechanical:**
- Operating Position: Vertical, filament end up
- Maximum Overall Length: 24-1/2"
- Maximum Diameter: 9-1/2"
- Terminal Diagram (See Dimensional Outline):
  ![Terminal Diagram](image)

**Thermal:**
- Water Flow: 20 to 25 gpm
  The specified water flow must start before the application of any voltages, and may be removed simultaneously with the filament and plate power.
- Air Flow:
  - To plate seal and bulb:
    - At frequencies below 1.7 Mc: Natural
    - At frequencies above 1.7 Mc: Up to 250 cfm
    - Adequate forced-air cooling should be provided to limit the temperature of the plate seal and bulb to their specified maximum values. The amount of air flow required will increase with the operating frequency. The cooling air should start before the application of any voltages and should be distributed uniformly around the plate seal by means of a suitable air manifold and air deflector. The airflow may be removed simultaneously with filament and plate power.
To filament seals and grid seal . . . . . . 10 min. cfm
The specified air flow should be directed vertically
from a 1-1/4" diameter nozzle into the filament heater
before and during the application of any voltages. It
may be removed simultaneously with filament and plate
power.

Outlet Water Temperature . . . . . . . . . . 70 max. °C
Bulb Temperature . . . . . . . . . . . . . . . . . . . . 180 max. °C
Seel Temperature (Filament, grid, and plate) . . . . . . 165 max. °C

AF POWER AMPLIFIER & MODULATOR — Class B
Maximum CCS\textsuperscript{a} Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>15000 max. volts</td>
</tr>
<tr>
<td>MAX.—SIGNAL DC PLATE CURRENT\textsuperscript{b}</td>
<td>6 max. amp</td>
</tr>
<tr>
<td>Max.—SIGNAL PLATE INPUT\textsuperscript{b}</td>
<td>90 max. kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION\textsuperscript{b}</td>
<td>50 max. kw</td>
</tr>
</tbody>
</table>

Typical Push-Pull Operation:

Values are for 2 tubes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10200 15000 volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-220 -320 volts</td>
</tr>
<tr>
<td>Peak AF Grid-to-Grid Voltage</td>
<td>900 1560 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>0.6 0.6 amp</td>
</tr>
<tr>
<td>Max.—Signal DC Plate Current</td>
<td>5.8 12 amp</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>3600 2640 ohms</td>
</tr>
<tr>
<td>Max.—Sig. Driving Power (Approx.)\textsuperscript{a}</td>
<td>120 688 watts</td>
</tr>
<tr>
<td>Max.—Sig. Power Output (Approx.)</td>
<td>37 117 kw</td>
</tr>
</tbody>
</table>

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use
with a maximum modulation factor of 1

Maximum CCS\textsuperscript{a} Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>12500 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-2000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>5.0 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>1.25 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>60 max. kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>33 max. kw</td>
</tr>
</tbody>
</table>

Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10200 12500 volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-1500 -1500 volts</td>
</tr>
<tr>
<td>From a fixed-supply</td>
<td>-1500 -1500 volts</td>
</tr>
<tr>
<td>From a grid resistor of 2100 ohms.</td>
<td>-1500 -1500 volts</td>
</tr>
<tr>
<td>From a grid resistor of 1400 ohms.</td>
<td>-1500 -1500 volts</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>2070 2180 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.3 4.5 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)\textsuperscript{e}</td>
<td>0.72 1.1 amp</td>
</tr>
<tr>
<td>Driving Power (Approx.)\textsuperscript{e}</td>
<td>1350 2180 watts</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>28 45 kw</td>
</tr>
</tbody>
</table>
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>17000</td>
<td></td>
<td>volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td></td>
<td>-2000</td>
<td>volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>9</td>
<td></td>
<td>amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>1.25</td>
<td></td>
<td>amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>150</td>
<td></td>
<td>kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>50</td>
<td></td>
<td>kw</td>
</tr>
</tbody>
</table>

Typical Operation in Grounded-Filament Circuit:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>14000</td>
<td>17000</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-900</td>
<td>-1450</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>1.2</td>
<td>1.1</td>
<td>amp</td>
</tr>
</tbody>
</table>

Peak RF Grid Voltage:

<table>
<thead>
<tr>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>2375</td>
<td>volts</td>
</tr>
</tbody>
</table>

Driving Power (Approx.)

<table>
<thead>
<tr>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1700</td>
<td>2300</td>
<td>watts</td>
</tr>
</tbody>
</table>

Power Output (Approx.)

<table>
<thead>
<tr>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>105</td>
<td>kw</td>
</tr>
</tbody>
</table>

Typical Operation in Grounded-Grid Circuit:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving Power (Approx.)</td>
<td>6250</td>
<td>11200</td>
<td>watts</td>
</tr>
<tr>
<td>Power Output</td>
<td>70</td>
<td>114</td>
<td>kw</td>
</tr>
</tbody>
</table>

Note:
- Continuous Commercial Service.
- Averaged over any audio-frequency cycle of sine-wave form.
- The driving stage should have good regulation and should be capable of supplying considerably more than the specified driving power.
- Obtained from a fixed supply, grid resistor, or a combination of both.
- For effect of load resistance on grid current and driving power, refer to Tube Ratings—Grid Current and Driving Power in the General Section.
- Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.
- Obtained from a fixed supply, a cathode resistor, a grid resistor, or from a combination of a fixed supply and self-bias.

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>265</td>
<td>305</td>
<td>amp</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>35</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Grid-Plate Capacitance</td>
<td>47</td>
<td>59</td>
<td>pf</td>
</tr>
<tr>
<td>Grid-Filament Capacitance</td>
<td>74</td>
<td>104</td>
<td>pf</td>
</tr>
<tr>
<td>Plate-Filament Capacitance</td>
<td>0.8</td>
<td>1.6</td>
<td>pf</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>-310</td>
<td>-490</td>
<td>volts</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>7100</td>
<td>9100</td>
<td>volts</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>3600</td>
<td>4600</td>
<td>volts</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>50</td>
<td></td>
<td>amp</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>80</td>
<td></td>
<td>kw</td>
</tr>
</tbody>
</table>

* Indicates a change.
Note 1: With 11 volts ac on filament.
Note 2: With dc grid voltage of -50 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.
Note 3: With dc plate voltage of 15000 volts, and with grid voltage adjusted to give dc plate current of 0.05 ampere.
Note 4: With dc grid voltage of -100 volts, and with plate voltage adjusted to give a dc plate current of 2 amperes.
Note 5: With dc grid voltage of 0 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.
Note 6: Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.
Note 7: With dc plate voltage of 17000 volts, dc plate current of 8.8 amperes, dc grid current of 1.05 to 1.25 amperes, grid resistor of 1600 ± 10% ohms, and frequency of 1.6 Mc.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE &amp; PLATE INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TELEPHONY</td>
</tr>
<tr>
<td></td>
<td>Class C Plate-Modulated</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>27</td>
<td>88</td>
</tr>
<tr>
<td>35</td>
<td>77</td>
</tr>
</tbody>
</table>

CURVES shown under Type 5671 also apply to the 5770

→ Indicates a change.
5770
POWER TRIODE

TOP VIEW

SEE NOTE
2 FILAMENT POSTS
.676" ±.010" DIA.

7.326"
±.015"
DIA.

30° ±.5°

30° ±.5°

12 HOLES
.175" DIA.
(Nº 16 DRILL)

GRID TERMINAL (SEE NOTE)

2 1/2"
MAX.

1 3/16"

7 1/2" MAX.
DIA.

2"

5.688"
±.015"
DIA.

4.500"
±.047"
DIA.

.500"
±.020"

13"
±.060"

NOTE: FLEXIBLE CONNECTIONS ARE REQUIRED.

92CM-7070

FEB. 1, 1949
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-7070
POWER TRIODE
WATER & FORCED-AIR COOLED

GENERAL DATA

Electrical:
Filament, Multistrand Thoriated-Tungsten:
Excitation ........ Single Phase AC or DC
Voltage ............ 7.5 ± 0.4 .... ac or dc volts
Current ........... 170 .......... amp
Starting Current: The filament current should never exceed 600
amperes, even momentarily.
Cold Resistance ........ 0.0055 .... ohm
Minimum Heating Time .... 15 .... seconds
Amplification Factor .... 20
Direct Interelectrode Capacitances (Approx.):
Grid to Plate ........... 24.5 .... µuf
Grid to Filament ....... 47 .... µuf
Plate to Filament ....... 3 .... µuf

Mechanical:
Terminal Connections:
F- Filament
G- Grid
P- Water-Cooled Plate

Mounting Position .... Vertical, Filament End Up
Maximum Overall Length .... 11-5/16""'
Maximum Diameter .......... 7"
Water Flow ........ 12 to 20 gpm

The specified water flow must start before application of any volt-
ages, and may be removed simultaneously with the filament and plate
power.
Air Flow ........ 20 min. cfm

The specified air flow should be directed vertically from a 3"-diameter
nozzle onto the top portion of the bulb before and during the appli-
cation of any voltages.
Outlet Water Temperature .... 70 max. °C
Bulb Temperature .... 180 max. °C
Seal Temperature (Filament, grid, plate) .... 165 max. °C

Components:
Water Jacket .......... RCA MI-19461
Jacket Wrench ........ RCA MI-19436
Gasket ........ RCA MI-7441
Terminal-Post Chuck Connector (4 required) .... RCA MI-19466
Chuck Wrench (2 required) ........ RCA MI-19424
Filament Transformer .... RCA-20371

AF POWER AMPLIFIER & MODULATOR - Class 8

Maximum CCS® Ratings, Absolute Values:
DC PLATE VOLTAGE .... 12500 max. volts

* See next page.

FEB. 1, 1949
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
### MAX.-SIGNAL DC PLATE CURRENT*  5 max. amp
### MAX. SIGNAL PLATE INPUT*  45 max. kw
### PLATE DISSIPATION*  22.5 max. kw

**Typical Operation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>12500 volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-600 volts</td>
</tr>
<tr>
<td>Peak AF Grid-to-Grid Voltage</td>
<td>1900 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>1 amp</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>6.4 amp</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate-to-plate)</td>
<td>4400 ohms</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>430 watts</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>55 kw</td>
</tr>
</tbody>
</table>

* Averaged over any audio-frequency cycle of sine-wave form.

**RF POWER AMPLIFIER - Class B Telephony**

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

**Maximum CCS° Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>12500 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>4 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>33 max. kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>22.5 max. kw</td>
</tr>
</tbody>
</table>

**Typical Operation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>12500 volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-625 volts</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>625 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.4 amp</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>0 amp</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>1070 watts</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>12 kw</td>
</tr>
</tbody>
</table>

* At crest of audio-frequency cycle with modulation factor of 1.0.

**PLATE-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 Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>10000 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-1600 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>4 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>0.8 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>40 max. kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>15 max. kw</td>
</tr>
</tbody>
</table>

°°: see next page.
## Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10000 volts</td>
</tr>
<tr>
<td>DC Grid Voltage*</td>
<td>1075 ohms</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>1440 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.8 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)*</td>
<td>0.78 amp</td>
</tr>
<tr>
<td>Driving Power (Approx.)*</td>
<td>1010 watts</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>29 kw</td>
</tr>
</tbody>
</table>

* Obtained by grid resistor of value shown or by partial self-bias methods.

## RF POWER AMPLIFIER & OSCILLATOR—Class C Telegraphy

**Key-down conditions per tube without modulation**

### Maximum CCS* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>12500 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-1600 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>6 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>0.8 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>60 max. kw</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>22.5 max. kw</td>
</tr>
</tbody>
</table>

### Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10000 volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-720 volts</td>
</tr>
<tr>
<td>Peak RF Grid Voltage</td>
<td>1290 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>4.5 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)*</td>
<td>0.69 amp</td>
</tr>
<tr>
<td>Driving Power (Approx.)*</td>
<td>800 watts</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>33 kw</td>
</tr>
</tbody>
</table>

* Continuous Commercial Service.

---

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>160</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.2</td>
<td>17</td>
</tr>
</tbody>
</table>

* Indicates a change.

MAY 20, 1949

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
### Grid-Plate Capacitance
- Min.: 20 µf
- Max.: 28 µf

### Grid-Filament Capacitance
- Min.: 39 µf
- Max.: 55 µf

### Plate-Filament Capacitance
- Min.: 2.3 µf
- Max.: 3.7 µf

### Plate Voltage
- Min.: 1,3
- Max.: 5300 volts
- Min.: 7900 volts

### Plate Voltage
- Min.: 1.4
- Max.: 2100 volts
- Min.: 3100 volts

### Peak Cathode Current
- Min.: 1.5
- Max.: 35 amp
- Min.: 33 amp

### Useful Power Output
- Min.: 1.6
- Max.: - kw

---

**Note 1:** With 7.5 volts ac on filament.

**Note 2:** With dc grid voltage of -100 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

**Note 3:** With dc grid voltage of -200 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

**Note 4:** With dc grid voltage of 0 volts, and with plate voltage adjusted to give dc plate current of 2 amperes.

**Note 5:** Represents the maximum usable cathode current (plate current and grid current) for the tube under any condition of operation.

**Note 6:** With dc plate voltage of 12500 volts, dc plate current of 4.8 amperes, dc grid current of 0.6 to 0.9 ampere, grid resistor of 1600 ± 10% ohms, and frequency of 22 Mc.

---

*Data on operating frequencies for the 5771 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.*
AVERAGE PLATE CHARACTERISTICS

$E_p = 7.5$ VOLTS AC

PLATE AMPERES

PLATE KILOVOLTS ($E_b$)

OCTOBER 28, 1948 TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-7106
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

E_f = 7.5 VOLTS AC
I_C = GRID AMPERES
I_b = PLATE AMPERES
5771

TYPICAL CHARACTERISTICS

$E_P = 7.5 \text{ VOLTS AC}$

GRID AMPERES

PLATE VOLTS ($E_B$)

OCTOBER 28, 1948

TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, Harrison, New Jersey

92CM-7107
HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:
Filament, Thoriated Tungsten:
Voltage... 1.6 ac volts
Current... 1.25 amp
Direct Interelectrode Capacitance:
Plate to Filament... 2.2 μf
Tube Voltage Drop at peak plate current... 1750 volts

with no external shield.

Mechanical:
Mounting Position... Any
Overall Length... 5-11/16" ± 5/32"
Seated Length... 5-1/6" ± 5/32"
Maximum Diameter... 2-1/16" Bulb... ST-16 Cap... Medium Base... Medium-Shell Small 4-Pin

Basing Designation for BOTTOM VIEW... 4P

Pin 1—Filament
Pin 2—No Connection
Pin 3—No Connection
Pin 4—Filament, Internal Shield
Cap—Plate

HALF-WAVE RECTIFIER

Maximum Ratings, Absolute Values:
For supply frequencies up to 250 kc

PEAK INVERSE PLATE VOLTAGE... 60000 max. volts
PEAK PLATE CURRENT... 40 max. ma
AVERAGE PLATE CURRENT... 2 max. ma
HOT-SWITCHING TRANSIENT CURRENT for duration of 0.1 sec. max... 100 max. ma
PLATE DISSIPATION... 3.5 max. watts
BULB TEMPERATURE... 80 max. °C

Typical Operation at 70 kc in Half-Wave Circuit
with Capacitor-Input to Filter:

AC Plate-Supply Voltage (RMS)... 21200 volts
Filter-Input Capacitor... 350 μf
Effective Plate-Supply Impedance... 120000 ohms
DC Output Current... 2 ma
DC Output Voltage at Input to Filter (Approx.):
At half-load current (1 ma)... 28000 volts
At full-load current (2 ma)... 26700 volts
Voltage Regulation (Approx.):
Half-load to full-load current... 1300 volts

SEPT. 15, 1949 TUBE DEPARTMENT TENTATIVE DATA
BRASS CORPORATION OF AMERICA, HARRISON, NEW JERSEY
HALF-WAVE VACUUM RECTIFIER

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td></td>
<td>1.15</td>
<td>1.35</td>
</tr>
<tr>
<td>Plate-Filament Capacitance</td>
<td></td>
<td>2.14</td>
<td>2.26</td>
</tr>
</tbody>
</table>

Note: With 1.6 volts dc on filament.

OPERATING NOTES

When the filament is supplied from an rf power source which is at a high dc potential above ground, adjustment of the filament voltage by direct measurement is usually impractical. However, a simple method utilizing visual comparison of filament temperatures can be used for adjustment of filament power. The color temperature of the filament operating from an rf power source may be checked visually by observing in a darkened room the reflection of the incandescent filament upon the surface of the internal shield. A visual comparison of this color temperature with that obtained when the filament of another 5825 is operated from a dc or low-frequency ac supply of 1.6 volts, provides a convenient means for adjusting the amount of rf excitation to produce 1.6 volts (rms) at the filament terminals.

The filament must never under any condition of operation be allowed to reach a temperature higher than that caused by operating the filament on dc or low-frequency ac at a voltage of 1.68 volts. Operation at higher temperatures will cause impaired performance of the tube. During circuit adjustment, however, it is permissible to allow the filament voltage to rise to 2 volts for the brief interval required to make the adjustment.

Soft x-rays are produced when the 5825 is operated at a plate voltage above approximately 20000 volts. These rays can constitute a health hazard unless the tube is adequately shielded. Relatively simple shielding should prove adequate, but the need for this precaution should be considered in equipment design.

SEPT. 15, 1949
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA
5825
HALF-WAVE VACUUM RECTIFIER

MEDIUM CAP

ST 16 BULB

MEDIUM-SHELL SMALL 4-PIN BASE

2 1/16" MAX.

5 1/16" ± 5/32"

5 1/16" ± 5/32"

92CS-7176

SEPT. 15, 1949  TUBE DEPARTMENT

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
HALF-WAVE VACUUM RECTIFIER

AVERAGE PLATE CHARACTERISTIC

TYPE 5825
$E_f=1.8$ VOLTS DC

PLATE MILLIAMPERES

0 400 800 1200 1600 2000 2400 2800
DC PLATE VOLTS

PLATE MILLIAMPERES

0 20 40 60 80

SEPT. 15, 1949 TUBE DEPARTMENT
BARDING CORPORATION OF AMERICA, HARRISON, NEW JERSEY
CE-7177T
High-Mu Triode

GLASS-METAL PENCIL TYPE
FAST WARM-UP TIME  STURDY COAXIAL-ELECTRODE STRUCTURE
For Use in Cathode-Drive Service at Frequencies up to 3000 Mc. The 5876A is Unilaterally Interchangeable with Type 5876.

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) ........................................ 6.3 ± 10% volts
Current at 6.3 volts ...................................... 0.135 amp
Amplification Factor .................................... 56
Transconductance, for dc plate ma. =
18, dc plate volts = 250 ................................. 6500 μmhos
Direct Interelectrode Capacitances:
Grid to plate ........................................ 1.4 μf
Grid to cathode ......................................... 2.4 μf
Plate to cathode ...................................... 0.035 max. μf

Mechanical:
Operating Position .................................. Any
Dimensions and Terminal
Connections .................................................. See Dimensional Outline
Socket for Heater Pins.  Grayhill No.22-3b, Cinch 54A16325e, of equivalent

Terminal Connections (See Dimensional Outline):

H-Heater  G-Grid
K-Cathode  P-Plate

Thermal:
Plate-SEal Temperature (Measured
on plate seal) .............................................. 175 max. °C

RF AMPLIFIER — Class A1
 Maximum CCs4 Ratings, Absolute-Maximum Values:
For altitudes up to 100,000 feet
and frequencies up to 1700 Mc

DC PLATE VOLTAGE ........................................ 300 max. volts
DC GRID VOLTAGE ....................................... -100 max. volts
DC PLATE CURRENT .................................... 25 max. ma
PLATE DISSIPATION ................................... 6.25 max. watts

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA I
5-62
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. 90 max. volts
Heater positive with respect to cathode. 90 max. volts

Maximum Circuit Values:
Grid-Circuit Resistance 0.5 max. negative

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy
Key-down conditions per tube without amplitude modulation

Maximum CCS Ratings, Absolute-Maximum Values:
For altitudes up to 100,000 feet
and frequencies up to 1700 Mc

DC PLATE VOLTAGE. 360 max. volts
DC GRID VOLTAGE -100 max. volts
DC PLATE CURRENT. 25 max. ma
DC GRID CURRENT. 8 max. ma
PLATE INPUT. 9 max. watts
PLATE DISSIPATION. 6.25 max. watts

PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. 90 max. volts
Heater positive with respect to cathode. 90 max. volts

Typical Operation in Cathode-Drive Circuit:
As oscillator

At frequency of 500 1700 5000 Mc
DC Plate-to-Grid Voltage. 262 252 252 volts
DC Cathode-to-Grid Voltage. 12 2 2 volts
DC Plate Current. 23 23 25 ma
DC Grid Current (Approx.) 6 3 4 ma
Useful Power Output (Approx.) 9 0.75 8.1 watts

As rf power amplifier at 500 Mc
DC Plate-to-Grid Voltage. 326 volts
DC Cathode-to-Grid Voltage. 51 volts
DC Plate Current. 23 ma
DC Grid Current (Approx.) 7 ma
Driver Power Output (Approx.) 2 watts
Useful Power Output (Approx.) 5 watts

Maximum Circuit Values:
Grid-Circuit Resistance 0.1 max. negative
PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS<sup>d</sup> Ratings, Absolute-Maximum Values:

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

- DC PLATE VOLTAGE: 275 max. volts
- DC GRID VOLTAGE: -100 max. volts
- DC PLATE CURRENT: 22 max. ma
- DC GRID CURRENT: 8 max. ma
- PLATE INPUT: 6 max. watts
- PLATE DISSIPATION<sup>e</sup>: 4.25 max. watts

PEAK HEATER-CATHODE VOLTAGE:
- Heater negative with respect to cathode: 90 max. volts
- Heater positive with respect to cathode: 90 max. volts

Maximum Circuit Values:
- Grid-Circuit Resistance: 0.1 max. megohm

FREQUENCY MULTIPLIER

Maximum CCS<sup>d</sup> Ratings, Absolute-Maximum Values:

For altitudes up to 100,000 feet and frequencies up to 1700 Mc

- DC PLATE VOLTAGE: 330 max. volts
- DC GRID VOLTAGE: -100 max. volts
- DC PLATE CURRENT: 22 max. ma
- DC GRID CURRENT: 8 max. ma
- PLATE INPUT: 7.5 max. watts
- PLATE DISSIPATION: 6.25 max. watts

PEAK HEATER-CATHODE VOLTAGE:
- Heater negative with respect to cathode: 90 max. volts
- Heater positive with respect to cathode: 90 max. volts

Typical CCS Operation in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th>Tripler to 480 Mc</th>
<th>Doubler to 960 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>390</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>90</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>18</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>6</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>2.1</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:
- Grid-Circuit Resistance: 0.1 max. 0.1 max. megohm
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td>1</td>
<td>0.127</td>
<td>0.143</td>
</tr>
<tr>
<td>Direct Interelectrode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>-</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Grid to cathode</td>
<td>-</td>
<td>2.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>-</td>
<td>0.035</td>
<td></td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>1,2</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>1,2</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From grid to plate and cathode connected together</td>
<td>1,3</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>From plate to grid and cathode connected together</td>
<td>1,4</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>1,5</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Emission Voltage</td>
<td>6</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1,7</td>
<td>41</td>
<td>71</td>
</tr>
<tr>
<td>Transconductance</td>
<td>1,7</td>
<td>5150</td>
<td>7850</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>1,7</td>
<td>12.5</td>
<td>23.5</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>1,8</td>
<td>-</td>
<td>55</td>
</tr>
<tr>
<td>Plate Current (3)</td>
<td>1,9</td>
<td>0.5</td>
<td>-</td>
</tr>
<tr>
<td>Power Output</td>
<td>1,10</td>
<td>0.285</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac or dc on heater.
Note 2: With 100 volts dc between heater and cathode.
Note 3: With grid 100 volts negative with respect to plate and cathode which are connected together.
Note 4: With plate 300 volts negative with respect to grid and cathode which are connected together.
Note 5: With dc plate voltage of 250 volts, dc grid voltage of \(-2.5\) volts, grid resistor of 0.5 megohm.
Note 6: With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma, and with 5.5 volts on heater.
Note 7: With dc plate-supply voltage of 250 volts, cathode resistor of 75 ohms, and cathode bypass capacitor of 1000 \(\mu\)f.
Note 8: With dc plate voltage of 250 volts and dc grid voltage of \(-12\) volts.
Note 9: With dc plate voltage of 250 volts and dc grid voltage of \(-5\) volts.
Note 10: With dc plate voltage of 200 volts, grid resistor adjusted to give a dc plate current of 18 milliamperes in a cavity-type oscillator operating at 1700 \pm 15\ Mc.
SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:
This test (similar to MIL-E-ID, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:
This test (similar to MIL-E-ID, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:
- Heater voltage of 6.3 volts, dc plate supply voltage of 250 volts, grid voltage of -2.5 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cps at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:
This test (similar to MIL-E-ID, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:
- Heater-Cathode Leakage Current: 50 max. μA
  For conditions shown under Characteristics Range Values Notes 1, 2.
- Low-Frequency Vibration (rms): 100 max. mv
  For conditions shown above under Low-Frequency Vibration Performance.
- Transconductance: 5150-min. μmhos
  For conditions shown under Characteristics Range Values Notes 1, 7.
- Plate Current (2): 55 max. μA
  For conditions shown under Characteristics Range Values Notes 1, 8.

Shorts and Continuity Test:
This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the
tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-I-D, Amendment 5.

Glass-Seal-Fracture Test:

This test is performed on a sample lot of tubes from each production run. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to tube axis, of a force of 30 pounds upon the grid flange without causing fracture of the glass insulation.

Heater Cycling Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or open circuits, and will meet the following limits:

Grid-Plate and Cathode
Leakage Resistance. . . . . . . . 25 min. megohms
For conditions shown under Characteristics Range Values Notes 1,3.

Heater-Cathode Leakage Current. . . . . 100 max. ma
For conditions shown under Characteristics Range Values Notes 1,2.

1-Hour Stability Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate dissipation of 2 to 2.5 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under Characteristics Range Values Notes 1,7.

50-Hour Survival Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1.b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for 1-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output . . . . . . . . . . . . . 0.2 min. watt
For conditions shown under Characteristics Range Values Notes 1,10.
Plate Current (2) .................. 100 max.  \( \mu \)A
For conditions shown under Characteristics Range Values
Notes 1,8.

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:
This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.3 volts, plate supply voltage of 300 volts, cathode resistor is adjusted to give a dc plate current of 25 ma and value is recorded, plate-circuit load resistance of zero ohms, heater positive with respect to cathode by 100 volts, and plate-seal temperature of 175\(^\circ\) C minimum. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off. At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Power Output .................. 0.2 min. watt
For conditions shown under Characteristics Range Values
Notes 1,10.

Plate Current (2) .................. 150 max.  \( \mu \)A
For conditions shown under Characteristics Range Values
Notes 1,8.

Shorts and Continuity Test specified above.

OPERATING CONSIDERATIONS
The mounting for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The mounting for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.

The heater pins of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
DIMENSIONS IN INCHES

NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.008".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL DISTANCE WILL NOT EXCEED 0.020".

Indicates a change.
AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS

PLATE (I_B) OR GRID (I_C) MILLIAMPERES

GRID VOLTS: $E_c = 0$

PLATE VOLTS: $E_f = 0$

92CM-7426
Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME

STURDY COAXIAL-ELECTRODE STRUCTURE

For Use in Cathode-Drive Service at Frequencies up to 4000 Mc

GENERAL DATA

**Electrical:**

Heater, for Unipotential Cathode:

Voltage (AC or DC):

- Under transmitting conditions: 6.0 ±5% volts
- Under standby conditions: 6.3 ±10% volts
- Current at 6.0 volts: 0.280 max. amp

Transconductance, for dc plate ma. = 25, dc plate volts = 200: 6000 µmhos

Direct Interelectrode Capacitances:

- Grid to plate: 1.7 µf
- Grid to cathode: 2.4 µf
- Plate to cathode: 0.07 max. µµf

**Mechanical:**

Operating Position: Any

Dimensions and Terminal Connections: See Dimensional Outline

Socket for Heater Pins: Grayhill No.22-3b, Cinch 54A16325c, or equivalent

Terminal Connections (See Dimensional Outline):

- H—Heater
- K—Cathode
- G—Grid
- P—Plate

**Thermal:**

Plate-Seal Temperature (Measured on plate seal): 175 max. °C

**RF AMPLIFIER — Class A1**

Maximum CCS\textsuperscript{d} Ratings, Absolute-Maximum Values:

- For altitudes up to 100,000 feet and frequencies up to 2000 Mc
- DC PLATE VOLTAGE: 330 max. volts
- DC GRID VOLTAGE: -100 max. volts

\textsuperscript{d} Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA I 5-62
DC PLATE CURRENT ........................................ 35 max. ma
PLATE DISSIPATION* .................................. 7 max. watts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode ........ 90 max. volts
Heater positive with respect to cathode .......... 90 max. volts

Maximum Circuit Values:
Grid-Circuit Resistance .................. 0.5 max. megohm

PLATE-PULSED OSCILLATORf — Class C

Maximum CCSd Ratings, Absolute-Maximum Values:
For altitudes up to 100,000 feet, frequencies up to 4000 Mc, and for a maximum "ON" time of 5 microseconds in any 5000-microsecond interval

PEAK POSITIVE-PULSE
PLATE-SUPPLY VOLTAGEh ................................ 1750 max. volts
PEAK NEGATIVE-PULSE
GRID-BIAS VOLTAGE .................................. 150 max. volts
PEAK PLATE CURRENT FROM PULSE SUPPLY. .... 3 max. amp
PEAK RECTIFIED GRID CURRENT .................. 1.3 max. amp
DC PLATE CURRENT .................................. 0.003 max. amp
DC GRID CURRENT .................................. 0.0013 max. amp
PLATE DISSIPATION* .................................. 6 max. watts
PULSE DURATION ...................................... 1.5 max. µsec

Typical Operation:
In cathode-drive circuit with rectangular wave shape at 3300 Mc, with duty factor of 0.001, and pulse duration of 1 microsecond

Peak Positive-Pulse
Plate-Supply Voltageh ................................ 1750 volts
Peak Negative-Pulse
Grid-Bias Voltage .................................. 110 volts
From grid resistor of ................................ 100 ohms
Peak Plate Current from Pulse Supply .......... 3 amp
Peak Rectified Grid Current .................. 1.1 amp
DC Plate Current .................................. 0.003 amp
DC Grid Current .................................. 0.0011 amp
Useful Power Output at
Peak of Pulseh (Approx.) .................. 1200 watts

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy
Key down conditions per tube without amplitude modulation

Maximum Ratings, Absolute-Maximum Values:
For altitudes up to 100,000 feet and frequencies up to 2000 Mc

<table>
<thead>
<tr>
<th>CCSd</th>
<th>ICASf</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>320 max.</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100 max.</td>
</tr>
<tr>
<td>Parameter</td>
<td>500 kHz</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>347</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>47</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>33</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>13</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>2</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values:**

- Grid-Circuit Resistance: 0.1 max. 0.1 max. megohm

---

**PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony**

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

**Maximum Ratings, Absolute-Maximum Values:**

*For altitudes up to 100,000 feet and frequencies up to 2000 Mc*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>260</td>
<td>320</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-100</td>
<td>-100</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>8.5</td>
<td>10.5</td>
</tr>
<tr>
<td>PEAK HEATER—CATHODE VOLTAGE</td>
<td>5</td>
<td>5.5</td>
</tr>
</tbody>
</table>

---

Heater negative with respect to cathode: 90 max. 90 max. volts
Heater positive with respect to cathode: 90 max. 90 max. volts

---

*Indicates a change.*
Typical Operation:

In cathode-drive circuit at 500 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>286</td>
<td>345</td>
<td>volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>36</td>
<td>45</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>30</td>
<td>30</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>11</td>
<td>12</td>
<td>ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1.8</td>
<td>2</td>
<td>watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>5.6</td>
<td>6.5</td>
<td>watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Circuit Resistance</td>
<td>0.1 max.</td>
</tr>
</tbody>
</table>

FREQUENCY DOUBLER

Maximum Ratings, Absolute-Maximum Values:

For altitudes up to 100,000 feet and frequencies up to 2000 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>260</td>
<td>320</td>
<td>volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100</td>
<td>-100</td>
<td>volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>33</td>
<td>33</td>
<td>ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>12</td>
<td>12</td>
<td>ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>8.5</td>
<td>10.5</td>
<td>watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>6</td>
<td>7.5</td>
<td>watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>90 max.</td>
<td>90 max.</td>
<td>volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>90 max.</td>
<td>90 max.</td>
<td>volts</td>
</tr>
</tbody>
</table>

Typical Operation:

In cathode-drive circuit up to 1000 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>290</td>
<td>350</td>
<td>volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>40</td>
<td>50</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>33</td>
<td>33</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>7</td>
<td>8</td>
<td>ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>3.2</td>
<td>3.5</td>
<td>watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>2.75</td>
<td>3</td>
<td>watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Circuit Resistance</td>
<td>0.1 max.</td>
</tr>
</tbody>
</table>

\[ a \] Without external shield.
\[ b \] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.
\[ c \] Cinch Manufacturing Company, 1026 South Roman Avenue, Chicago, Illinois.
\[ d \] Continuous Commercial Service.
\[ e \] In applications where the plate dissipation exceeds 2.5 watts, it is important that a large area of contact be provided between the plate cylinder and the connector in order to provide adequate heat conduction.
\[ f \] In this class of service, the heater should be allowed to warm up for a minimum of 60 seconds before plate voltage is applied.

\[ \rightarrow \] Indicates a change.
"QI" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70% of the peak power value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

The magnitude of any spike on the plate voltage pulse should not exceed a value of 2000 volts with respect to cathode and its duration should not exceed 0.01 microsecond measured at the peak-pulse-value level.

Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "ON" to total elapsed time in any 5000-microsecond interval.

The power output at peak of pulse is obtained from the average power output using the duty factor of the peak pulse. This procedure is necessary since the power output pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of rf power output.

Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Intermittent Commercial and Amateur Service. No operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or stand by period of at least the same or greater duration.

Obtained from grid resistor.

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.260</td>
<td>0.300</td>
</tr>
<tr>
<td>Direct Interelectrode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>1.30</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Grid to cathode</td>
<td>2.05</td>
<td>2.95</td>
<td></td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td>1,2</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with</td>
<td>1,2</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage Resistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From grid to plate and</td>
<td>1.4</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>cathode tied together</td>
<td></td>
<td></td>
<td>megoHms</td>
</tr>
<tr>
<td>From plate to grid and</td>
<td>1.5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>cathode tied together</td>
<td></td>
<td></td>
<td>megoHms</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>1.7</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>Emission Voltage</td>
<td>1.8</td>
<td>18</td>
<td>96</td>
</tr>
<tr>
<td>Peak Emission Current</td>
<td>1.8</td>
<td>18</td>
<td>96</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transconductance</td>
<td>1.8</td>
<td>4800</td>
<td>7200</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td></td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>1.9</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Power Output</td>
<td>1.10</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Power Output at Peak of Pulse</td>
<td>1.11</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>Change in Output Frequency</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: With 6.0 volts ac or dc on heater.
Note 2: With 100 volts dc between heater and cathode.
Note 3: With grid 100 volts negative with respect to plate and cathode which are tied together.
Note 4: With plate 300 volts negative with respect to grid and cathode which are tied together.

--- Indicates a change.
Note 5: With dc plate voltage of 200 volts, dc grid voltage of -2.5
volts, grid resistor of 0.1 megohm.

Note 6: With dc voltage on grid and plate which are tied together
adjusted to produce a cathode current of 30 ma, and with 5.4
volts on heater.

Note 7: With 150 volts on grid and plate which are connected together,
duty factor of 0.001, and pulse duration of 1 microsecond.

Note 8: With dc plate voltage of 200 volts, cathode resistor of 100 ±
10% ohms, and cathode bypass capacitor of 1000 μf.

Note 9: With dc plate voltage of 200 volts, dc grid voltage of -20 volts.

Note 10: With dc plate voltage of 350 volts, cathode resistor adjusted
to give a dc plate current of 33 milliamperes in a cavity-type
oscillator operating at 500 ± 15 Mc.

Note 11: With peak positive-pulse plate supply voltage of 1750 volts,
grid resistor varied to give dc plate current of 3 ma, dc grid
current of approximately 1.3 ma, duty factor of 0.001, pulse
duration of 1 microsecond, and frequency of 3300 ± 100 Mc.

Note 12: At end of Peak Power Output test, reduce heater voltage to 5.4
volts and note change in output frequency, then increase heater
voltage to 6.3 volts and note change in output frequency.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:
This test (similar to MIL-E-10, paragraph 4.9.12.1) is
performed on a sample lot of tubes from each production run.
Tubes are tested in a chamber at an air pressure equivalent
to an altitude of 100,000 feet. Breakdown will not occur when
a 60-cycle rms voltage of 400 volts is applied between the
plate cylinder and grid flange.

Low-Frequency Vibration Performance:
This test (similar to MIL-E-10, paragraph 4.9.19.1) is
performed on a sample lot of tubes from each production run
under the following conditions:
Heater voltage of 6.0 volts, dc plate supply voltage of
200 volts, grid voltage of -2.5 volts, and plate load
resistor of 10,000 ohms. The tubes are vibrated in a plane
perpendicular to the tube axis at 25 cycles per second at
an acceleration of 2.5 g. The rms output voltage across
the plate load resistor as a result of vibration of the
tube will not exceed 100 millivols.

High-Frequency Vibration Performance:
This test (similar to MIL-E-10, paragraph 4.9.19.2) is
performed on a sample lot of tubes from each production run.
The tube is vibrated perpendicular to its axis, with no
voltages applied to the tube. Vibration frequency is 40 to 60
cps and acceleration is 10 g. At the end of this test, tubes
will not show permanent shorts or open circuits.

Shorts and Continuity Test:
This test (similar to MIL-E-10, paragraph 4.7.3) is per-
formed on all tubes from each production run. In this test,
a tube is considered inoperative if it shows a permanent or
temporary short or open circuit, an air leak, or reverse grid
current in excess of 1 microampere for the conditions shown
under Characteristics Range Values, Notes 1, 5.
Glass Seal Fracture Tests:

Fracture tests are performed on sample lots of tubes from each production run.

1. Tubes are placed on supports spaced 15/16" ± 1/64" apart with the grid flange centered between these supports. Tubes will withstand gradual application, perpendicular to the tube axis, of a force of 50 pounds upon the grid flange without causing fracture of the glass insulation.

2. Tubes are held by clamping to the cathode terminal. Tubes will withstand gradual application of a torque of 15 inch-pounds upon the plate terminal without causing fracture of the glass insulation.

100-Hour Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 3300 ± 100 Mc under the following conditions:

- Heater voltage of 6.0 volts, peak positive-pulse plate supply voltage of 1750 volts, grid resistor is adjusted to give a dc plate current of 3 ma., dc grid current of approximately 1.3 ma., duty factor of 0.001, and pulse duration of 1 microsecond.

At the end of 100 hours, the tubes will have a minimum peak pulse power output of 600 watts.

500-Hour Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

- Heater voltage of 6.0 volts, plate supply voltage of 350 volts, cathode resistor is adjusted to give a dc plate current of 33 ma.

At the end of 500 hours, the tubes will have a minimum power output of 3.5 watts.

Operating Considerations

The mounting for this type in coaxial-line, parallel-line, or lumped circuits may support the tube securely by any one of the three terminals. Connections to the other two terminals must be made by contacts with flexible leads.

The mounting for this type in cavity-type circuits should preferably support the tube by the grid flange which should make firm contact to the cavity surface.

The heater pins of this type should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.
The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.

NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF PLATE TERMINAL OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.010".

NOTE 2: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.020".
PULSE REPETITION RATE = 1000 PPS
PULSE DURATION = 1 MICROSECOND
FREQUENCY = 3375 MC
CIRCUIT EFFICIENCY = 25%
Power Triode

FORCED-AIR COOLED GROUNDED-GRID TYPE
For UHF Plate-Pulsed Oscillator and Amplifier Service

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) .... 6.3 volts
Current 3.4 amp
Minimum heating time 1 minute
Amplification Factor 25
Direct Inter-electrode Capacitances:
Grid to plate 6.0 pf
Grid to cathode 11.0 pf
Plate to cathode 0.19 max. pf

Mechanical:
Operating Position Any
Overall Length 3-5/16" ± 3/32"
Diameter 1.750" ± 0.010"
Weight (Approx.) 8 oz
Radiator Integral part of tube
Mounting Special
Terminal Diagram (See Dimensional Outline):

Thermal:
Air Flow:
The specified air flow for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower onto the respective terminals and seals, and through the radiator before and during the application of any voltages. Heater power, plate power, and air may be removed simultaneously.

<table>
<thead>
<tr>
<th>Plate Dissipation</th>
<th>Min. Air Flow</th>
<th>Static Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>watts</td>
<td>cfm</td>
<td>in. of water</td>
</tr>
<tr>
<td>150</td>
<td>5.7</td>
<td>0.16</td>
</tr>
<tr>
<td>200</td>
<td>10</td>
<td>0.4</td>
</tr>
<tr>
<td>250</td>
<td>16</td>
<td>0.85</td>
</tr>
</tbody>
</table>

The above flow and pressure values are for condition with radiator temperature held constant at 135 °C rise above ambient temperature. The air flow must be adequate to limit the temperature of the radiator, grid terminal, cathode terminal, and seals to their respective maximum values.

Radiator Temperature (Measured on core at end adjacent to plate ring) 180 max. °C
Grid-Terminal Temperature 150 max. °C

Indicates a change.
Cathode-Terminal Temperature: 150 max. °C  
Seal Temperature (Plate, grid, and cathode): 150 max. °C

### PLATE-PULSED OSCILLATOR & AMPLIFIER

<table>
<thead>
<tr>
<th>Maximum Ratings, Absolute-Maximum Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>For maximum &quot;on&quot; time of 10 μsec 100 μsec</td>
</tr>
<tr>
<td>PEAK POSITIVE-PULSE</td>
</tr>
<tr>
<td>PLATE-SUPPLY VOLTAGE 7500 max. 7500 max. volts</td>
</tr>
<tr>
<td>PEAK NEGATIVE-PULSE</td>
</tr>
<tr>
<td>GRID-BIAS VOLTAGE 600 max. 600 max. volts</td>
</tr>
<tr>
<td>PEAK PLATE CURRENT FROM PULSE SUPPLY 4.5 max. 3.5 max. amp</td>
</tr>
<tr>
<td>PEAK RECTIFIED GRID CURRENT 1 max. 0.75 max. amp</td>
</tr>
<tr>
<td>DC PLATE CURRENT 0.045 max. 0.250 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT 0.010 max. 0.070 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT 340 max. 340 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION 250 max. 250 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation with Rectangular Wave Shape in Oscillator Circuit at 1250 Mc:**

*With duty factor of 0.01*

#### Peak Positive-Pulse
- Plate-Supply Voltage 5500 7500 volts

#### Peak Negative-Pulse
- Grid-Bias Voltage 375 500 volts
- Cathode Resistor 100 100 ohms
- Peak RF Grid Voltage 625 850 volts
- Peak Plate Current
  - From Pulse Supply 3.5 4.5 amp
  - Rectified Grid Current 0.25 0.5 amp
  - DC Plate Current 0.035 0.045 amp
  - DC Grid Current 0.0025 0.005 amp
  - Useful Power Output
    - at Peak of Pulse (Approx.) 8000 14000 watts

*With external shield connected to grid.*

"On" time is defined as the sum of the durations of all the individual pulses which occur during the interval of 1000 microseconds. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The *peak* value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

Duty factor is the product of pulse duration and repetition rate. For variable pulse durations and pulse repetition rates, the duty factor is defined as the ratio of time "on" to total elapsed time in any 500-microsecond interval.

It is recommended that the entire bias be obtained from a cathode resistor. In certain applications, partial grid-resistor bias may be used.

The power output at peak of pulse is obtained from the average power output using the duty factor of the peak power output pulse. This procedure is necessary since the power output pulse duty factor may be less than the applied voltage pulse duty factor because of a delay in the start of rf power output.

---

*Indicates a change.*
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>3.05</td>
<td>3.75</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.2</td>
<td>18</td>
<td>32</td>
</tr>
<tr>
<td>Grid-Plate Capacitance</td>
<td>-</td>
<td>5.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Grid-Cathode Capacitance</td>
<td>-</td>
<td>10.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Plate-Cathode Capacitance</td>
<td>3</td>
<td>0.12</td>
<td>0.26</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1.4</td>
<td>500</td>
<td>850</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1.5</td>
<td>690</td>
<td>1140</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>1.6</td>
<td>-</td>
<td>-165</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>1.7</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse</td>
<td>1.8</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts on heater.
Note 2: With dc grid voltage of -15 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.
Note 3: With external shield connected to grid terminal.
Note 4: With dc grid voltage of -10 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.
Note 5: With dc grid voltage of -20 volts, and dc plate voltage adjusted to give dc plate current of 250 milliamperes.
Note 6: With dc plate voltage of 1600 volts, and dc grid voltage adjusted to give dc plate current of 1 milliamperes.
Note 7: Represents the maximum value of cathode current (Plate current and grid current) for the tube under any condition of operation.
Note 8: With peak positive-pulse plate-supply voltage of 7500 volts, cathode-bias resistor of 100 ± 10 per cent ohms, peak plate current from pulse supply of 4.5 amperes, peak rectified grid current of 0.5 ampere, duty factor of 0.01, and frequency of 1250 Mc.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>Operating Frequency (Mc)</th>
<th>Maximum Permissible Percentage of Maximum Rated Plate Voltage &amp; Plate Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1300</td>
<td>Plate-Pulsed Oscillator and Amplifier Service 100</td>
</tr>
<tr>
<td>2000</td>
<td>75</td>
</tr>
</tbody>
</table>

DIMENSIONAL OUTLINE and MOUNTING ARRANGEMENT shown under Type 6161 also apply to the 5946

OPERATING NOTES

Rated heater voltage should be applied for at least one minute to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes. In circuits where the plate is grounded and the negative pulse is applied to the cathode, the heater supply must be insulated to withstand the peak-positive-pulse plate-supply voltage, and it should also present a minimum amount of capacitance loading to the pulse-supply source.

→ indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 2
4-63
AVERAGE CHARACTERISTICS

$E_0 = 6.3$ VOLTS

PLATE ($I_B$) OR GRID ($I_C$) AMPERES

PLATE KILOVOLTS ($E_B$)

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
For radiosonde service at 400 Hz

**OSCILLATOR TRIODE**

**GENERAL DATA**

**Electrical:**
- **Heater, for Unipotential Cathode:**
  - Voltage range: 5.2 to 6.6 volts
  - Current at 6.3 volts: 0.2 amp
- **Direct Inter electrode Capacitances (Approx.):**
  - Grid to plate: 1.3 µuf
  - Grid to cathode and heater: 2 µuf
  - Plate to cathode and heater: 0.42 µuf

**Characteristics, Class A Amplifier:**
- **Plate-Supply Voltage:** 120 volts
- **Cathode Resistor:** 220 ohms
- **Amplification Factor:** 24
- **Plate Resistance (Approx.):** 4000 ohms
- **Transconductance:** 5900 μmhos
- **Plate Current:** 12 ma

**Mechanical:**
- **Mounting Position:** Any
- **Maximum Length (Excluding flexible leads):** 1-1/2”
- **Length, Bulb Seat to Bulb Top (Excluding tip):** 1.200” ± 0.060”
- **Maximum Diameter:** 0.400”
- **Dimensional Outline:** See General Section
- **Bulb:** T-3
- **Leads, Flexible:** 5
- **Length:** 1-1/2” to 1-3/4”
- **Orientation and diameter:** See Dimensional Outline

**BOTTOM VIEW**

- Lead 3 - Cathode
- Lead 4 - Heater
- Lead 5 - Heater
- Lead 7 - Grid
- Lead 8 - Plate

**OSCILLATOR - Class C Telegraphy**

**Maximum Ratings**, Absolute Values:
- **DC PLATE VOLTAGE:** 150 max. volts
- **DC GRID VOLTAGE:** -50 max. volts
- **TOTAL CATHODE CURRENT:** 40 max. ma

*Heater-voltage range and maximum ratings are established on basis that tube heater will be supplied from batteries in radiosonde and similar applications utilizing equipment designed for extreme compactness and light weight and requiring tube life of only a few hours.*

*Without external shield.*

**TUBE DIVISION**

ELECTRO CORPORATION OF AMERICA, MUNGO, NEW JERSEY
Oscillator Triode

DC Grid Current: 10 max. ma
Plate Input: 3.3 max. watts
Plate Dissipation: 3 max. watts
Peak Heater-Cathode Voltage: 0 max. volts

Typical Operation as Oscillator at 400 Mc:
DC Plate Voltage: 135 volts
Grid Resistor: 1300 ohms
DC Plate Current: 20 ma
DC Grid Current (Approx.): 9.5 ma
Useful Power Output: 1.25 watts

Characteristics Range Values for Equipment Design

Heater Current:
- With 5.2 volts ac on heater: 0.176 – 0.225 amp
- With 6.6 volts ac on heater: 0.176 – 0.225 amp

Direct Interelectrode Capacitances:
- Grid to plate: 1.05 – 1.55 µµf
- Grid to cathode and heater: 1.55 – 2.45 µµf
- Plate to cathode and heater: 0.345 – 0.495 µµf

Amplification Factor:
- 17 – 31

Transconductance:
- 4200 – 7600 µµhos
- 4600 – 8000 µµhos

Plate Current:
- 8 – 16 ma

Plate Current:
- 9.5 – 18.5 ma

Plate Current:
- 5 – 300 µµamp

Note 1: Without external shield.
Note 2: With 5.2 or 6.3 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.
Note 3: With 5.2 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.
Note 4: With 6.3 volts ac on heater, dc plate-supply volts = 120, and cathode resistor (ohms) = 220.
Note 5: With 5.2 volts ac on heater, dc plate-supply volts = 120, dc grid volts = -12, and cathode resistor (ohms) = 220.

Operating Considerations

It is recommended that the cathode of the 6026 be connected directly to the heater.

The flexible leads of the 6026 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals and damage the tube.
Beam Power Tube

HIGH POWER SENSITIVITY
90 WATTS CW INPUT (ICAS) UP TO 60 Mc
60 WATTS CW INPUT (ICAS) AT 175 Mc

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) .................. 6.3 ± 10% volts
Current at heater volts = 6.3 ........ 1.25 amp
Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100 .......... 7000 μmhos
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100 .. 4.5
Direct Interelectrode Capacitances:
Grid No.1 to plate ................ 0.24 max. pf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater ... 13.0 pf
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater .... 8.5 pf

Mechanical:
Operating Position .................. Any
Maximum Overall Length ........... 3-13/16"
Seated Length ...................... 3-1/8" ± 1/8"
Maximum Diameter ................. 1-23/32"
Weight (Approx.) ................... 2.3 oz
Cap .................... Small (JEDEC No.C1-1)
Bases (Alternates):
Large-Wafer Octal with Sleeve:
8-Pin (JEDEC Group 1, No.88-86)
Large-Wafer with External Barriers and Sleeve:
8-Pin (JEDEC Group 1, No.88-98)
Basing Designation for BOTTOM VIEW .................. 7CK

Pin 1 - Cathode, Grid No.3, Internal Shield
Pin 2 - Heater
Pin 3 - Grid No.2
Pin 4 - Same as Pin 1
Pin 5 - Grid No.1
Pin 6 - Same as Pin 1
Pin 7 - Heater
Pin 8 - Base Sleeve Cap - Plate

Indicates a change.
### AF Power Amplifier & Modulator — Class AB<sub>1</sub>

#### Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS&lt;sup&gt;c&lt;/sup&gt;</th>
<th>ICAS&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600 max.</td>
<td>750 max.</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 max.</td>
<td>250 max.</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>125 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Max.-Signal Plate Input&lt;sup&gt;a&lt;/sup&gt;</td>
<td>60 max.</td>
<td>85 max.</td>
</tr>
<tr>
<td>Max.-Signal Grid-No.2 Input&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3 max.</td>
<td>3 max.</td>
</tr>
<tr>
<td>Plate Dissipation&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20 max.</td>
<td>25 max.</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>220 max.</td>
<td>220 max.</td>
</tr>
</tbody>
</table>

#### Typical CCS Push-Pull Operation:

**Values are for 2 tubes**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>180</td>
<td>185</td>
<td>180</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage: From fixed-bias source.</td>
<td>-40</td>
<td>-45</td>
<td></td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage&lt;sup&gt;a&lt;/sup&gt;</td>
<td>80</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>63</td>
<td>57</td>
<td>26</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>228</td>
<td>215</td>
<td>200</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>25</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>4000</td>
<td>5500</td>
<td>7000</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>55</td>
<td>70</td>
<td>82</td>
</tr>
</tbody>
</table>

#### Typical ICAS Push-Pull Operation:

**Values are for 2 tubes**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage: From fixed-bias source.</td>
<td>-50</td>
<td>-50</td>
<td></td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage&lt;sup&gt;a&lt;/sup&gt;</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>28</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>220</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current&lt;sup&gt;a&lt;/sup&gt;</td>
<td>27</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>6000</td>
<td>8000</td>
<td></td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>95</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>
Maximum Circuit Values (CCS or ICAS):
Grid-No.1-Circuit Resistance under any condition:
- With fixed bias: 0.1 max. megohm
- With cathode bias: Not recommended

AF POWER AMPLIFIER & MODULATOR — Class AB₁
Triode Connection—Grid No.2 Connected to Plate

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>400 max.</td>
<td>400 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td>90 max.</td>
<td>90 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT</td>
<td>35 max.</td>
<td>35 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max.</td>
<td>25 max.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>BULB TEMPERATURE (At hottest point on bulb surface)</td>
<td>220 max.</td>
<td>220 max.</td>
</tr>
</tbody>
</table>

Typical Push-Pull Operation:
Values are for 2 tubes

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>250 max. 400</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage.</td>
<td>-50 -100</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>100 200</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>120 40</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current.</td>
<td>125 100</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate-to-plate)</td>
<td>5000 8000</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>10 22</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>22</td>
</tr>
</tbody>
</table>

Max.-Signal PLATE DISSIPATION: 20 max. 25 max. watts

AF POWER AMPLIFIER & MODULATOR — Class AB₂

Maximum Circuit Values (CCS or ICAS):
Grid-No.1-Circuit Resistance under any condition:
- With fixed bias: 0.1 max. megohm
- With cathode bias: 0.5 max. megohm
**PEAK HEATER-CATHODE VOLTAGE:**
Heater negative with respect to cathode. ... 135 max. 135 max. volts
Heater positive with respect to cathode. ... 135 max. 135 max. volts

**BULB TEMPERATURE (At hottest point on bulb surface).** ... 220 max. 220 max. °C

**Typical CCS Push-Pull Operation:**

<table>
<thead>
<tr>
<th>Values are for 2 tubes</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From fixed-bias source.</td>
<td>-44</td>
<td>-44</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage.</td>
<td>95</td>
<td>102</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>33</td>
<td>27</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current.</td>
<td>232</td>
<td>242</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current.</td>
<td>1.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current.</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current.</td>
<td>1.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate).</td>
<td>3700</td>
<td>4600</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)k</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>62</td>
<td>63</td>
</tr>
</tbody>
</table>

**Typical ICAS Push-Pull Operation:**

<table>
<thead>
<tr>
<th>Values are for 2 tubes</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>190</td>
<td>165</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From fixed-bias source.</td>
<td>-48</td>
<td>-46</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage.</td>
<td>109</td>
<td>108</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current.</td>
<td>270</td>
<td>240</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current.</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current.</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current.</td>
<td>2</td>
<td>2.6</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate).</td>
<td>5000</td>
<td>7400</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)k</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>113</td>
<td>131</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values (CCS or ICAS):**

<table>
<thead>
<tr>
<th>Grid-No.1-Circuit Resistance:</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>With fixed bias</td>
<td>30000 max.</td>
<td>ohms</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
<td></td>
</tr>
</tbody>
</table>

*Indicates a change.*
PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1 and at frequencies up to 60 Mc

Max. Carrier Conditions per Tube for Use with a Maximum Modulation Factor of 1 and at Frequencies up to 60 Mc

**Maximum Ratings, Absolute-Maximum Values:**

For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart 1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>480 max.</td>
<td>600 max.</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 max.</td>
<td>250 max.</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-150 max.</td>
<td>-150 max.</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>117 max.</td>
<td>125 max.</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>3.5 max.</td>
<td>4 max.</td>
</tr>
<tr>
<td>Plate Input</td>
<td>45 max.</td>
<td>67.5 max.</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>2 max.</td>
<td>2 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>13.3 max.</td>
<td>16.7 max.</td>
</tr>
</tbody>
</table>

**Peak Heater-Cathode Voltage:**
- Heater negative with respect to cathode: 135 max. volts
- Heater positive with respect to cathode: 135 max. volts

**Bulb Temperature (At hottest point on bulb surface):** 220 max. °C

**Typical Operation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400</td>
<td>475</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.2 series resistor of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33000 ohms</td>
<td>150</td>
<td>-</td>
</tr>
<tr>
<td>51000 ohms</td>
<td>-</td>
<td>135</td>
</tr>
<tr>
<td>56000 ohms</td>
<td>-</td>
<td>150</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.1 resistor of 27000 ohms</td>
<td>-87</td>
<td>-77</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>107</td>
<td>95</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>112</td>
<td>94</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>7.8</td>
<td>6.4</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>3.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>32</td>
<td>34</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values (CCS or ICAS):**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance</td>
<td>30000 max.</td>
<td>ohms</td>
</tr>
</tbody>
</table>
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

RF POWER AMPLIFIER — Class C FM Telephony

Maximum Ratings, Absolute-Maximum Values:

At frequencies up to 60 Mc. For maximum plate voltage
and maximum plate input above 60 Mc, see Rating Chart II.

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>600 max.</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>250 max.</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-150 max.</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>140 max.</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>3.5 max.</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>67.5 max.</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>3 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max.</td>
</tr>
</tbody>
</table>

PEAK HEATER-CATHODE VOLTAGE:

Heater negative with
respect to cathode... 135 max. 135 max. volts
Heater positive with
respect to cathode... 135 max. 135 max. volts

BULB TEMPERATURE (At hottest
point on bulb surface)... 220 max. 220 max. °C

Typical Operation:

As amplifier up to 60 Mc

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>500</th>
<th>600</th>
<th>600</th>
<th>750</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.2 series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>resistor of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36000 ohms</td>
<td>170</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>51000 ohms</td>
<td>-</td>
<td>150</td>
<td>-</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>43000 ohms</td>
<td>-</td>
<td>-</td>
<td>180</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>56000 ohms</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>160</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.1 resistor of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27000 ohms</td>
<td>-66</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>20000 ohms</td>
<td>-</td>
<td>-58</td>
<td>-</td>
<td>-62</td>
<td>volts</td>
</tr>
<tr>
<td>24000 ohms</td>
<td>-</td>
<td>-</td>
<td>-71</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>From cathode resistor of:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>430 ohms</td>
<td>-</td>
<td>-</td>
<td>-71</td>
<td>-</td>
<td>volts</td>
</tr>
<tr>
<td>470 ohms</td>
<td>-66</td>
<td>-58</td>
<td>-</td>
<td>-62</td>
<td>volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>84</td>
<td>73</td>
<td>91</td>
<td>79</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>135</td>
<td>112</td>
<td>150</td>
<td>120</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2.5</td>
<td>2.8</td>
<td>2.8</td>
<td>3.1</td>
<td>ma</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>watt</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>48</td>
<td>52</td>
<td>66</td>
<td>70</td>
<td>watts</td>
</tr>
</tbody>
</table>

Typical Operation:

As amplifier up to 175 Mc

| DC Plate Voltage | 320 | 400 | volts |

---

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
**DC Grid-No.2 Voltage:**

<table>
<thead>
<tr>
<th>Resistance (ohms)</th>
<th>Voltage (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13000</td>
<td>190</td>
</tr>
<tr>
<td>20000</td>
<td>190</td>
</tr>
</tbody>
</table>

**DC Grid-No.1 Voltage:**

<table>
<thead>
<tr>
<th>Resistance (ohms)</th>
<th>Voltage (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27000</td>
<td>51</td>
</tr>
<tr>
<td>24000</td>
<td>54</td>
</tr>
</tbody>
</table>

From cathode resistor of 330 ohms:
- Voltage: -51 volts
- Power: 28 watts

**Peak RF Grid-No.1 Voltage:** 64 volts
**DC Plate Current:** 140 ma
**DC Grid-No.2 Current:** 10 ma
**DC Grid-No.1 Current (Approx.):** 2 ma
**Driving Power (Approx.):** 3 watts
**Power Output (Approx.):** 85 watts

**Maximum Circuit Values (CCS or ICA):**

**Grid-No.1 Circuit Resistance:** 30000 max. ohms

**Maximum Circuit Values (CCS or ICA):**

**Grid-No.1 Circuit Resistance:** 30000 max. ohms

**a** Without external shield.
**b** Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
**c** Continuous Commercial Service.
**d** Intermittent Commercial and Amateur Service.
**e** Averaged over any audio-frequency cycle of sine-wave form.
**f** Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider.
**g** The driver stage should be capable of supplying the No.1 grids of the class AB2 stage with the specified driving voltage at low distortion.
**h** The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer or impedance coupling devices are recommended.
**i** Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
**j** Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB2 stage.
**k** To minimize distortion, the effective resistance per grid-No.1 circuit of the AB2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30000 ohms when the 6146 is operated at maximum ratings. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100000 ohms.
**l** Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.
**m** Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

**When grid No.1 is driven positive and the 6146 is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100000 ohms.**

**f** Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

**Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 6146 is used in a cir-
cuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.

Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>1.175</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid-No.1 to plate</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>Grid-No.1 to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater</td>
<td>2</td>
<td>12.0</td>
</tr>
<tr>
<td>Plate to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater</td>
<td>2</td>
<td>7.3</td>
</tr>
<tr>
<td>Plate Current</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>Dynamic Grid-No.2 Current</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>4</td>
<td>47</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac on heater.
Note 2: Without external shield.
Note 3: With rated ac heater voltage, dc plate volts = 300, dc grid-No.2 volts = 200, and dc grid-No.1 volts = –11.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE &amp; PLATE INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mc</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TELEPHONY</td>
</tr>
<tr>
<td></td>
<td>Class C</td>
</tr>
<tr>
<td></td>
<td>Voltage</td>
</tr>
<tr>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>125</td>
<td>65</td>
</tr>
<tr>
<td>150</td>
<td>58</td>
</tr>
<tr>
<td>160</td>
<td>56</td>
</tr>
<tr>
<td>175</td>
<td>53</td>
</tr>
</tbody>
</table>

— Indicates a change.
OPERATING CONSIDERATIONS

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 percent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The maximum-rated plate and grid-No. 2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel cannot possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.
RATING CHART I
Class C Telephony Service

$E_F = 6.3$ VOLTS

FREQUENCY - Mc

INPUT + KG2S

VOLTAGE - 1GA

VOLTAGE - EC3

INPUT + CC5

MAXIMUM PLATE INPUT - WATTS

MAXIMUM PLATE VOLTS

0 50 100 150 200

20 40 60 80

200 400 600 800
RATING CHART II
Class C Telegraphy Service

$E_f = 6.3 \text{ VOLTS}$

FREQUENCY - Mc

MAXIMUM PLATE INPUT - WATTS

INPUT - 16A5

VOLTAGE - 16A5

INPUT - C6S

VOLTAGE - C6S

92CM-7709RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 6
1-63
TYPICAL CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-$N^2$ VOLTS = 200

GRID - $N^2$ MILLIAMPERES

PLATE VOLTS

GRID -$N^2$ VOLTS $E_G = 20$
$E_p = 6.3$ VOLTS
GRID -$N^2$ VOLTS = 200

GRID -$N^2$ MILLIAMPERES

PLATE VOLTS

92CS-9618
TYPICAL PLATE CHARACTERISTICS

$E_f = 6.3$ VOLTS
GRID-N°2 VOLTS = 150

PLATE MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

\[ E_f = 6.3 \text{ VOLTS} \]
\[ \text{GRID-NO 2 VOLTS} = 150 \]

\[ E_f = 6.3 \text{ VOLTS} \]
\[ \text{GRID-NO 2 VOLTS} = 150 \]

\[ \text{GRID-NO 1 VOLTS, } E_C = +20 \]
\[ +10 \]
\[ -10 \]

\[ \text{GRID-NO 1 VOLTS, } E_C = -20 \]
\[ -10 \]
\[ -20 \]

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 8
1-63
TYPICAL CHARACTERISTICS
Triode Connection

$E_g = 6.3$ VOLTS
GRID NO. 2 CONNECTED TO PLATE.

GRID-NR 1 ($I_C$) MILLIAMPERES

PLATE (I_b) MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electron Tube Division  Harrison, N. J.
Beam Power Tube

HIGH POWER SENSITIVITY
90 WATTS CW INPUT (ICAS)
UP TO 60 Mc
CONTROLLED ZERO-BIAS
PLATE CURRENT

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6146A is Unilaterally Interchangeable with the 6146.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
Voltage (Ac or DC)\textsuperscript{a} \hspace{1cm} 6.3 \text{ volts}
Current at heater volts = 6.3 \hspace{1cm} 1.25 \text{ amp}
Transconductance, for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100 
\hspace{1cm} 7000 \text{ \mu} \text{hos}
Mu-Factor, Grid No.2 to Grid No.1
for plate volts = 200, grid-No.2 volts = 200, and plate ma. = 100.
\hspace{1cm} 4.5
Direct Interelectrode Capacitances:\textsuperscript{b}
Grid No.1 to plate. \hspace{1cm} 0.24 \text{ max. \ \mu} \text{f}
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater. \hspace{1cm} 13.0 \text{ \mu} \text{f}
Plate to cathode & grid No.3 & internal shield, grid No.2, base sleeve, and heater. \hspace{1cm} 8.5 \text{ \mu} \text{f}

Mechanical:

Operating Position. \hspace{1cm} Any
Maximum Overall Length. \hspace{1cm} 3-13/16" 
Seated Length \hspace{1cm} 3-1/8" \pm 1/8"
Maximum Diameter. \hspace{1cm} 1-23/32"
Weight (Approx.). \hspace{1cm} 2.3 oz
Bulb. \hspace{1cm} Small (JEDEC No.C1-1)
Cap. \hspace{1cm} 8-Pin (JEDEC Group 1, No.E8-86)
Bases (Alternates):
Large-Wafer Octal with Sleeve:
8-Pin (JEDEC Group 1, No.B8-86)
Large-Wafer Octal with External Barriers and Sleeve:
8-Pin (JEDEC Group 1, No.B8-98)
Small-Wafer Octal with Sleeve:
8-Pin (JEDEC Group 1, No.B8-150)
Small-Wafer Octal with External Barriers and Sleeve:
8-Pin (JEDEC Group 1, No.B8-159)
Basing Designation for BOTTOM VIEW. .......... 7CK

Pin 1 — Cathode, Grid No. 3, Internal Shield
Pin 2 — Heater
Pin 3 — Grid No. 2
Pin 4 — Same as Pin 1
Pin 5 — Grid No. 1
Pin 6 — Same as Pin 1
Pin 7 — Heater
Pin 8 — Base Sleeve Cap—Plate

Bulb temperature (At hottest point on bulb surface) ........... 220 max. °C

AF POWER AMPLIFIER & MODULATOR — Class AB1°

Maximum Ratings, Absolute—Maximum Values:

<table>
<thead>
<tr>
<th>Description</th>
<th>CCS*</th>
<th>ICAS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>600 max.</td>
<td>750 max.</td>
</tr>
<tr>
<td>DC GRID-No. 2 VOLTAGE</td>
<td>250 max.</td>
<td>250 max.</td>
</tr>
<tr>
<td>MAX.—SIGNAL DC PLATE CURRENT</td>
<td>125 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>MAX.—SIGNAL PLATE INPUT</td>
<td>60 max.</td>
<td>85 max.</td>
</tr>
<tr>
<td>MAX.—SIGNAL GRID-No. 2 INPUT</td>
<td>3 max.</td>
<td>3 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max.</td>
<td>25 max.</td>
</tr>
<tr>
<td>PEAK HEATER—CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
</tbody>
</table>

Typical CCS Push-Pull Operation:

<table>
<thead>
<tr>
<th>Description</th>
<th>Values are for 2 tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400 500 600 volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>190 185 180 volts</td>
</tr>
<tr>
<td>DC Grid-No. 1 Voltage:</td>
<td></td>
</tr>
<tr>
<td>From fixed-bias source</td>
<td>-40 -40 -45 volts</td>
</tr>
<tr>
<td>Peak AF Grid-No. 1—to-Grid-No. 1</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>80 80 90 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>63 57 26 ma</td>
</tr>
<tr>
<td>Max.—Signal DC Plate Current</td>
<td>228 215 200 ma</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No. 2 Current</td>
<td>2.5 2 1 ma</td>
</tr>
<tr>
<td>Max.—Signal DC Grid-No. 2 Current</td>
<td>25 25 23 ma</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>4000 5500 7000 ohms</td>
</tr>
<tr>
<td>Max.—Signal Driving Power (Approx.)</td>
<td>0 0 0 watts</td>
</tr>
<tr>
<td>Max.—Signal Power Output (Approx.)</td>
<td>55 70 82 watts</td>
</tr>
</tbody>
</table>

Typical ICAS Push-Pull Operation:

<table>
<thead>
<tr>
<th>Description</th>
<th>Values are for 2 tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600 750 volts</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>200 195 volts</td>
</tr>
</tbody>
</table>
DC Grid-No.1 Voltage:
From fixed-bias source. ..... -50 -50 volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage: ..... 100 100 volts
Zero-Signal DC Plate Current. ..... 28 23 ma
Max.-Signal DC Plate Current. ..... 229 220 ma
Zero-Signal DC Grid-No.2 Current. ..... 1 1 ma
Max.-Signal DC Grid-No.2 Current. ..... 27 26 ma
Effective Load Resistance
(Plate to plate). ..... 6000 8000 ohms
Max.-Signal Driving Power (Approx.). ..... 0 0 watts
Max.-Signal Power Output (Approx.). ..... 95 120 watts

Maximum Circuit Values (CCS or ICAS):
Grid-No.1-Circuit Resistance under any condition:
With fixed bias. ..... 0.1 max. megohm
With cathode bias. ..... Not recommended

AF POWER AMPLIFIER & MODULATOR — Class AB2k
Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>DC GRID-No.2 VOLTAGE.</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENTf</td>
<td>MAX.-SIGNAL PLATE INPUTf</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUTf</td>
<td>PLATE DISSIPATIONf</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>Heater negative with respect to cathode.</td>
</tr>
<tr>
<td></td>
<td>Heater positive with respect to cathode.</td>
</tr>
<tr>
<td></td>
<td>Max.-Signal DC Grid-No.2 Current.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>Heater negative with respect to cathode.</td>
</tr>
<tr>
<td></td>
<td>Heater positive with respect to cathode.</td>
</tr>
</tbody>
</table>

Typical CCS Push-Pull Operation:
Values are for a tubes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>500</td>
<td>600</td>
<td>volts</td>
<td>175</td>
<td>175</td>
<td>165</td>
<td>volts</td>
<td>95</td>
</tr>
</tbody>
</table>
Max.-Signal Power Output
(Approx.) 62 83 90 watts

Typical ICAS Push-Pull Operation:
Values are for 2 tubes
DC Plate Voltage 600 750 volts
DC Grid-No.2 Voltage 160 165 volts
DC Grid-No.1 Voltage:
From fixed-bias source -48 -46 volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage 100 106 volts
Zero-Signal DC Plate Current 20 22 ma
Max.-Signal DC Plate Current 270 240 ma
Zero-Signal DC Grid-No.2 Current 1.2 0.3 ma
Max.-Signal DC Grid-No.2 Current 20 20 ma
Max.-Signal DC Grid-No.1 Current 2 2.4 ma
Effective Load Resistance
(Plate to plate) 5000 7400 ohms
Max.-Signal Driving Power (Approx.) 0.3 0.4 watt
Max.-Signal Power Output (Approx.) 113 131 watts

Maximum Circuit Values (CCS or ICAS):
Grid-No.1-Circuit Resistance:
With fixed bias 30000 max. ohms
With cathode bias Not recommended

LINEAR RF POWER AMPLIFIER — Class AB1
Single-Sideband Suppressed-Carrier Service

CCS ICAS

Maximum Ratings, Absolute-Maximum Values up to 60 MC:
DC PLATE VOLTAGE 600 max. 750 max. volts
DC GRID-No.2 VOLTAGE 250 max. 250 max. volts
MAX.-SIGNAL DC PLATE CURRENT 125 max. 135 max. ma
MAX.-SIGNAL PLATE INPUT 80 max. 85 max. watts
MAX.-SIGNAL GRID-No.2 INPUT 3 max. 3 max. watts
PLATE DISSIPATION 20 max. 25 max. watts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode 136 max. 136 max. volts
Heater positive with respect to cathode 136 max. 136 max. volts

Typical "Single-Tone" Operation:
At 60 MC
DC Plate Voltage 400 600 600 750 volts
DC Grid-No.2 Voltage 190 190 200 195 volts
DC Grid-No.1 Voltage -40 -45 -50 -50 volts
Zero-Signal DC Plate Current 32 13 14 12 ma
Effective RF Load Resistance 2000 3500 3000 4000 ohms

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
### Maximum Circuit Values (CCS or ICAS):

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.-Signal DC PLATE CURRENT</td>
<td>114 ma</td>
</tr>
<tr>
<td>Max.-Signal DC GRID-No.2 CURRENT</td>
<td>12 ma</td>
</tr>
<tr>
<td>Max.-Signal Peak RF GRID-No.1 Voltage</td>
<td>40 volts</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0 watts</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>27 watts</td>
</tr>
</tbody>
</table>

### Maximum Circuit Values (CCS or ICAS):

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.-Signal DC PLATE CURRENT</td>
<td>117 ma</td>
</tr>
<tr>
<td>Max.-Signal DC GRID-No.1 CURRENT</td>
<td>3 ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>45 ma</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>2 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>13.3 max.</td>
</tr>
</tbody>
</table>

### PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

**Carrier conditions per tube for use with a maximum modulation factor of 1 and at frequencies up to 60 Hz**

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>480 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>250 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-150 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>117 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>3.5 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>45 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>2 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>13.3 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode</td>
<td>135 max. volts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE: Heater positive with respect to cathode</td>
<td>135 max. volts</td>
</tr>
</tbody>
</table>

### Typical Operation:

| DC PLATE VOLTAGE | 400 volts |
| DC GRID-No.2 Voltage: | 475 volts |
| From a grid-No.2 series resistor of: | |
| 33000 ohms | 150 volts |
| 51000 ohms | 135 volts |
| 56000 ohms | 150 volts |
| DC GRID-No.1 VOLTAGE: | |
| From a grid-No.1 resistor of 27000 ohms | -87 volts |
| Peak RF GRID-No.1 Voltage | 107 volts |
| DC PLATE CURRENT | 112 ma |
| DC GRID-No.2 Current | 7.8 ma |
| DC Grid-No.1 Current (Approx.) | 3.4 ma |
### Driving Power (Approx.)

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>0.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

### Power Output (Approx.)

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watt</td>
<td>32</td>
<td>34</td>
</tr>
</tbody>
</table>

### Maximum Circuit Value (CCS or ICAS):

| Grid-No.1-Circuit Resistance° | 30000 max. ohms |

### RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

### RF POWER AMPLIFIER — Class C FM Telephony

### Maximum Ratings, Absolute-Maximum Values:

At frequencies up to 60 Mc. For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II.

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>600 max.</th>
<th>750 max.</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No. 2 VOLTAGE</td>
<td>250 max.</td>
<td>250 max.</td>
<td>volts</td>
</tr>
<tr>
<td>DC GRID-No. 1 VOLTAGE</td>
<td>-150 max.</td>
<td>-150 max.</td>
<td>volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>140 max.</td>
<td>150 max.</td>
<td>ma</td>
</tr>
<tr>
<td>DC GRID-No. 1 CURRENT</td>
<td>3.5 max.</td>
<td>4 max.</td>
<td>ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>67.5 max.</td>
<td>90 max.</td>
<td>watts</td>
</tr>
<tr>
<td>GRID-No. 2 INPUT</td>
<td>3 max.</td>
<td>3 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max.</td>
<td>25 max.</td>
<td>watts</td>
</tr>
</tbody>
</table>

### PEAK HEATER-CATHODE VOLTAGE:

- Heater negative with respect to cathode: 135 max. volts
- Heater positive with respect to cathode: 135 max. volts

### Typical Operation:

**As amplifier up to 60 Mc**

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>500</th>
<th>600</th>
<th>600</th>
<th>750</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No. 2 Voltage</td>
<td>27000 ohms</td>
<td>36000 ohms</td>
<td>51000 ohms</td>
<td>43000 ohms</td>
<td>56000 ohms</td>
</tr>
<tr>
<td>From a grid-No. 2 series resistor of:</td>
<td>24000 ohms</td>
<td>470 ohms</td>
<td>- 66</td>
<td>- 58</td>
<td>- 62</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC Grid-No. 1 Voltage</th>
<th>27000 ohms</th>
<th>470 ohms</th>
<th>Peak RF Grid-No. 1 Voltage</th>
<th>84</th>
<th>73</th>
<th>91</th>
<th>79</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>From a grid-No. 1 resistor of:</td>
<td>24000 ohms</td>
<td>- 66</td>
<td>58</td>
<td>- 62</td>
<td>volts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From cathode resistor of:</td>
<td>430 ohms</td>
<td>-</td>
<td>- 71</td>
<td>volts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>135</td>
<td>112</td>
<td>150</td>
<td>123</td>
<td>ma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid-No. 2 Current</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>ma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid-No. 1 Current (Approx.)</td>
<td>2.5</td>
<td>2.8</td>
<td>2.8</td>
<td>3.1</td>
<td>ma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.2</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>watts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>48</td>
<td>52</td>
<td>66</td>
<td>70</td>
<td>watts</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Typical Operation:

**As amplifier up to 175 Volts**

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td></td>
<td>400</td>
</tr>
</tbody>
</table>

**DC Grid-No.2 Voltage:**
- From grid-No.2 series resistor of:
  - 13000 ohms: 1300 Volts
  - 20000 ohms: 190 Volts

**DC Grid-No.1 Voltage:**
- From a grid-No.1 resistor of:
  - 27000 ohms: -54 Volts
  - 24000 ohms: -54 Volts
- From cathode resistor of
  - 390 ohms: -54 Volts

**Peak RF Grid-No.1 Voltage**
- 64 Volts
- 68 Volts

<table>
<thead>
<tr>
<th>DC Grid-No.2 Current</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC Grid-No.1 Current (Approx.)</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Driving Power (Approx.)</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Output (Approx.)</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

## Maximum Circuit Values (CCS or ICAS):

- **Grid-No.1 Circuit Resistance:** 30000 max. ohms

### Notes:
- **a** Heater voltage fluctuations will cause variations in power output. See Test No. 8 under Characteristics Range Values.
- **b** Without external shield.
- **c** Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.
- **d** Continuous Commercial Service.
- **e** Intermittent Commercial and Amateur Service.
- **f** Averaged over any audio-frequency cycle of sine-wave form.
- **g** Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider.
- **h** The driver stage should be capable of supplying the No.1 grids of the class AB2 stage with the specified driving voltage at low distortion.
- **i** The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer or impedance coupling devices are recommended.
- **k** Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
- **m** Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB2 stage.
- **n** To minimize distortion, the effective resistance per grid-No.1 circuit of the AB2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30000 ohms when the 6146A is operated at maximum ratings. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100000 ohms.
- **p** "Single-Tone" operation refers to that class of amplifier service in which the grid No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- **q** Obtained preferably from a separate, well regulated source.
- **r** Obtained from a fixed supply.
- **s** Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.
t Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

u When grid No.1 is driven positive and the 6146A is operated at maximum ratings, the total dc grid-No.1-circuit resistance should not exceed the specified value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100000 ohms.

v Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 11% per cent of the carrier conditions.

w Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 6146A is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 400 volts under key-up conditions.

x Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td>1</td>
<td>1.175</td>
<td>1.325</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.24</td>
</tr>
<tr>
<td>Grid-No.1 to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater</td>
<td>2</td>
<td>12.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Plate to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater</td>
<td>2</td>
<td>7.3</td>
<td>9.5</td>
</tr>
<tr>
<td>3. Plate Current</td>
<td>1.3</td>
<td>46</td>
<td>94</td>
</tr>
<tr>
<td>4. Zero-Bias Plate Current</td>
<td>1.4</td>
<td>330</td>
<td>-</td>
</tr>
<tr>
<td>5. Grid-No.2 Current</td>
<td>1.3</td>
<td>-</td>
<td>5.5</td>
</tr>
<tr>
<td>6. Dynamic Grid-No.2 Current</td>
<td>1.5</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>7. Useful Power Output I</td>
<td>1.5</td>
<td>47</td>
<td>-</td>
</tr>
<tr>
<td>8. Useful Power Output II</td>
<td></td>
<td></td>
<td>See Note 6</td>
</tr>
</tbody>
</table>

**Note 1:** With 6.3 volts ac on heater.

**Note 2:** Without external shield.

**Note 3:** With dc plate volts = 300, dc grid-No.2 volts = 200, and dc grid-No.1 volts = -33.

**Note 4:** With dc plate volts = 100, dc grid-No.2 volts = 200, and dc grid-No.1 volts = -100. Grid No.1 is square-wave pulsed at 100 kc to zero volts. Limit value is peak-pulse current.

**Note 5:** In a single-tube, self-excited oscillator circuit, and with dc plate volts = 600, dc grid-No.2 volts = 180, grid-No.1 resistor (ohms) = 30000 ± 10%, dc plate ma. = 112, dc grid-No.1 ma. = 2 to 2.5, and frequency (Kc) = 15.

**Note 6:** With conditions in test No.7 reduce heater voltage to 5 volts. Useful power output shall be at least 90 per cent of that at heater voltage = 6.3.
MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>OPERATING FREQUENCY</th>
<th>MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE &amp; PLATE INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TELEPHONY</td>
</tr>
<tr>
<td></td>
<td>Class C Plate-Modulated</td>
</tr>
<tr>
<td>Voltage</td>
<td>Input</td>
</tr>
<tr>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td>125</td>
<td>65</td>
</tr>
<tr>
<td>150</td>
<td>58</td>
</tr>
<tr>
<td>160</td>
<td>56</td>
</tr>
<tr>
<td>175</td>
<td>53</td>
</tr>
</tbody>
</table>

OPERATING CONSIDERATIONS

The maximum bulb temperature of 220° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y.

To insure adequate cooling it is essential that free circulation of air be provided around the tube. In most cases, no additional air is required.

The plate shows no color when the 6146A is operated at full ratings under either CCS or ICAS conditions.

Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The maximum-rated plate and grid-No. 2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.
CAP
JEDEC No. C1-1

TI2 BULB

BASE
JEDEC GROUP I
No. B8-86
B8-98
B8-150
OR
B8-159

D I M E N S I O N S  I N  I N C H E S
RATING CHART I
Class C Telephony Service

\[ \text{E}_c = 6.3 \text{ VOLTS} \]

\[ \text{FREQUENCY} - \text{MC} \]

\[ \text{MAXIMUM PLATE VOLTS} \]

\[ \text{INPUT - WATTS} \]

\[ \text{VOLTAGE - CA} \]

\[ \text{VOLTAGE - CE} \]

\[ \text{INPUT - CE} \]

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
DATA 6
8-63
RATING CHART II
Class C Telegraphy Service

$E_f = 6.3 \text{ VOLTS}$

![Graph showing maximum plate input-watts against frequency.](image)

**INPUT** : 164.6

**VOLTAGE** : 76.4

**INPUT** : 125.6

**VOLTAGE** : 66.3

---

RADIO CORPORATION OF AMERICA
Electronic Components and Devices  Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS

\[ E_f = 6.3 \text{ VOLTS} \]
\[ \text{GRID-N}^2 \text{ VOLTS} = 200 \]

\[ \text{PLATE MILLIAMPERES} \]

\[ 0 \quad 100 \quad 200 \quad 300 \quad 400 \quad 500 \quad 600 \quad 700 \quad 800 \]

\[ 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \]

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
DATA 7
0-63
TYPICAL CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-Nº 2 VOLTS = 200

- Grid-1: VOLTS ECl - 20
- Grid-2: MILLIAMPERES

PLATE VOLTS

GRID-1: MILLIAMPERES

RADIO CORPORATION OF AMERICA

Electronic Components and Devices
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS

$E_T = 6.3 \text{ VOLTS}$

GRID-N°2 VOLTS = 150

PLATE MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
TYPICAL CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-NO 2 VOLTS = 150

GRID-NO 1 VOLTS $E_G$ = +20

GRID-NO 1 VOLTS $E_G$ = -10

GRID-NO 2 MILLIAMPERES

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 5- TO 8-VOLT RANGE

85 WATTS CW INPUT (ICAS)  50 WATTS CW INPUT (ICAS)
UP TO 60 Mc  AT 175 Mc
CONTROLLED ZERO-BIAS  CONTROLLED POWER OUTPUT
PLATE CURRENT  AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an AF Power Amplifier and Modulator in Both Mobile and Fixed Equipment. The 6146B/8298A is Unilaterally Interchangeable with types 6146, 6146A, and 8298.

Electrical:
Heater, for Unipotential Cathode:
  Voltage (AC or DC) ........................................ 6.3 volts
  Current at heater volts = 6.3. ......................... 1.125 amp
  Minimum heating time .................................. 60 sec
(See Special Performance Data for heater operation in stationary and mobile equipment)
Transconductance, for plate volts = 200,
  grid-No.2 volts = 200, and plate ma. = 100. .......... 7000 µmhos
Mu-Factor, Grid No.2 to Grid No.1 for
  plate volts = 200, grid-No.2 volts = 200,
  and plate ma. = 100. .................................. 4.5
Direct Interelectrode Capacitances:
  Grid No.1 to plate ..................................... 0.22 max. pf
  Grid No.1 to cathode & grid No.3
  & internal shield, grid No.2, base sleeve, and heater.. 13.0 pf
  Plate to cathode & grid No.3
  & internal shield, grid No.2, base sleeve, and heater.. 8.5 pf

Mechanical:
Operating Position ........................................ Any
Maximum Overall Length .................................. 3-13/16" ± 1/8"
Seated Length. ............................................. 3-1/8" ± 1/8"
Maximum Diameter ........................................ 1-21/32"
Weight (Approx.) .......................................... 2.3 oz
Bulb .......................................................... T12
Cap. .......................................................... Small (JEDEC No.C1-1)
Bases (Alternates):
  Small-Wafer Octal with Sleeve:
    8-Pin (JEDEC Group 1, No.B8-150)
  Small-Wafer Octal with External Barriers and Sleeve:
    8-Pin (JEDEC Group 1, No.B9-159)
### Basing Designation for BOTTOM VIEW

- **Pin 1** - Cathode, Grid No.3, Internal Shield
- **Pin 2** - Heater
- **Pin 3** - Grid No.2
- **Pin 4** - Same as Pin 1
- **Pin 5** - Grid No.1
- **Pin 6** - Same as Pin 1
- **Pin 7** - Heater
- **Pin 8** - Base Sleeve

**Cap - Plate**

**Cap - Plate**

**Bulb Temperature (At hottest point on bulb surface)**

- 260 max. °C

---

### AF POWER AMPLIFIER & MODULATOR — Class AB1b

#### Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600 max.</td>
<td>750 max.</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 max.</td>
<td>250 max.</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>175 max.</td>
<td>220 max.</td>
</tr>
<tr>
<td>Max.-Signal Plate Input</td>
<td>90 max.</td>
<td>120 max.</td>
</tr>
<tr>
<td>Max.-Signal Grid-No.2 Input</td>
<td>3 max.</td>
<td>3 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>27 max.</td>
<td>35 max.</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
</tbody>
</table>

#### Typical Push-Pull Operation:

**Values are for 2 tubes**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With fixed-bias source</td>
<td>-47</td>
<td>-48</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Max.-Signal DC Grid No.2 Current</td>
<td>14.8</td>
<td>12.6</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>5600</td>
<td>7200</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>96</td>
<td>124</td>
</tr>
</tbody>
</table>
Maximum Circuit Values (CCS or ICAS):
Grid-No.1 Circuit Resistance
under Any Condition:
With fixed bias. 0.1 max. megohm
With cathode bias. Not recommended

AF POWER AMPLIFIER & MODULATOR — Class AB2

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600 max.</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 max.</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>175 max.</td>
</tr>
<tr>
<td>Max.-Signal Plate Input</td>
<td>90 max.</td>
</tr>
<tr>
<td>Max.-Signal Grid-No.2 Input</td>
<td>3 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>27 max.</td>
</tr>
</tbody>
</table>

Peak Heater-Cathode Voltage:
Heater negative with respect to cathode 135 max. volts
Heater positive with respect to cathode 135 max. volts

Typical Push-Pull Operation:
Values are for 2 tubes

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500 500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 200</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage: From fixed-bias source</td>
<td>-46 -48</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid No.1 Voltage</td>
<td>108 108</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>50 50</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>308 270</td>
</tr>
<tr>
<td>Max.-Signal DC Grid No.2 Current</td>
<td>26 27</td>
</tr>
<tr>
<td>Max.-Signal DC Grid No.1 Current</td>
<td>2.7 1.3</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>3620 5200</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0.2 0.7</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>100 110</td>
</tr>
</tbody>
</table>

Maximum Circuit Values (CCS or ICAS):
Grid-No.1 Circuit Resistance:
With fixed bias 30000 max. ohms
With cathode bias Not recommended
LINEAR RF POWER AMPLIFIER — Class AB
Single-Sideband Suppressed-Carrier Service

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

CCS  ICAS

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>175</td>
<td>220</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>135</td>
<td>135</td>
</tr>
</tbody>
</table>

Typical Operation with "Two-Tone Modulation":

At 30 Mc

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-47</td>
<td>-48</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>2600</td>
<td>3600</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>86</td>
<td>86</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td>7.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>5</td>
<td>3.9</td>
</tr>
<tr>
<td>Distortion Products Level:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Third order</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Fifth order</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>24.5</td>
<td>30.5</td>
</tr>
<tr>
<td>Peak envelope</td>
<td>49</td>
<td>61</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-No.1 Circuit Resistance under Any Condition:
With fixed bias: 30000 max. ohms

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1; at frequencies up to 60 Mc

CCS  ICAS

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>480</td>
<td>600</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250</td>
<td>250</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy**

**RF POWER AMPLIFIER — Class C FM Telephony**

**Maximum Ratings, Absolute-Maximum Values:**

At frequencies up to 60 Mc. For maximum plate voltage and maximum plate input above 60 Mc., see Rating Chart II

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
<th>Plate Input</th>
<th>Grid-No.2 Input</th>
<th>Plate Dissipation</th>
<th>Peak Heater-Cathode Voltage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>600 max.</td>
<td>250 max.</td>
<td>150 max.</td>
<td>175 max.</td>
<td>3.5 max.</td>
<td>175 max.</td>
<td>90 max.</td>
<td>3 max.</td>
<td>27 max.</td>
<td>135 max. Heater negative with respect to cathode.</td>
</tr>
<tr>
<td>750 max.</td>
<td>250 max.</td>
<td>150 max.</td>
<td>200 max.</td>
<td>4 max.</td>
<td>220 max.</td>
<td>120 max.</td>
<td>3 max.</td>
<td>35 max.</td>
<td>135 max. Heater positive with respect to cathode.</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.

DATA 3

2-64
**Typical Operation:**

As amplifier, up to 60 Hz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.1 resistor of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24000 ohms.</td>
<td>-70</td>
<td>-</td>
</tr>
<tr>
<td>28000 ohms.</td>
<td>-</td>
<td>-77</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>150</td>
<td>160</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2.8</td>
<td>2.7</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>63</td>
<td>65</td>
</tr>
</tbody>
</table>

**Typical Operation:**

As amplifier, up to 175 Hz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>320</td>
<td>400</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>210</td>
<td>220</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid-No.1 resistor of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26000 ohms.</td>
<td>-52</td>
<td>-</td>
</tr>
<tr>
<td>30000 ohms.</td>
<td>-</td>
<td>-55</td>
</tr>
<tr>
<td>24000 ohms.</td>
<td>-</td>
<td>-56</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>65</td>
<td>67</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>170</td>
<td>180</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Power Output (Approx.)</td>
<td>29</td>
<td>40</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values (CCS or ICAS):**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance</td>
<td>30000 max. ohms</td>
</tr>
</tbody>
</table>

---

*With no external shield.

† Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

Continuous Commercial Service

Intermittent Commercial and Amateur Service

Averaged over any audio-frequency cycle of sine-wave form.

Obtained preferably from a separate source or from the plate voltage supply with a voltage divider.

The driver stage should be capable of supplying the No.1 grids of the class AB₂ stage with the specified driving voltage at low distortion.

h The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer or impedance coupling devices are recommended.

j Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

k Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB₂ stage.

m To minimize distortion, the effective resistance per grid-No.1 circuit of the AB₂ stage should be held at a low value. For this purpose the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30,000 ohms when the tube is operated at maximum ratings. For operation at less than maximum ratings, the dc grid-No.1-circuit resistance may be as high as 100,000 ohms.
a. Obtained preferably from a separate, well-regulated source.

b. Referenced to either of the two tones and without the use of feedback to enhance linearity.

c. Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

d. Obtained from grid-no.1 resistor or from a combination of grid-no.1 resistor with either fixed supply or cathode resistor.

e. When grid no.1 is driven positive and the tube is operated at maximum ratings, the total dc grid-no.1-circuit resistance should not exceed the specified value of 50,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-no.1-circuit resistance may be as high as 100,000 ohms.

f. Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-no.2 resistor should be used only when the tube is used in a circuit which is not keyed. Grid-no.2 voltage must not exceed 35 volts under key-up conditions.

g. Obtained from fixed-supply, by grid-no.1 resistor, by cathode resistor, or by combination methods.

**CHARACTERISTICS RANGE VALUES**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate . . .</td>
<td>1</td>
<td>D.22</td>
<td>pf</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater . . .</td>
<td>12.0</td>
<td>15.0</td>
<td>pf</td>
</tr>
<tr>
<td>Plate to cathode &amp; grid No.3 &amp; internal shield, base sleeve, grid No.2, and heater . . .</td>
<td>7.3</td>
<td>9.5</td>
<td>pf</td>
</tr>
<tr>
<td>2. Plate Current. . . . . .</td>
<td>2</td>
<td>46</td>
<td>94 ma</td>
</tr>
<tr>
<td>3. Zero-Bias Plate Current. . . . . .</td>
<td>3</td>
<td>330</td>
<td>- ma</td>
</tr>
<tr>
<td>4. Grid-No.2 Current. . . . . .</td>
<td>2</td>
<td>-</td>
<td>5.5 ma</td>
</tr>
</tbody>
</table>

**Note 1:** With no external shield.

**Note 2:** With heater voltage of 6.75 volts, dc plate voltage of 400 volts, dc grid-no.2 voltage of 200 volts, and dc grid-No.1 voltage of -34 volts.

**Note 3:** With heater voltage of 6.75 volts, dc plate voltage of 100 volts, dc grid-no.2 voltage of 200 volts, and dc grid-No.1 voltage of -100 volts. Grid No.1 is square-wave pulsed at 1000 kc to zero volts. Limit value is peak-pulse current.

**SPECIAL PERFORMANCE DATA**

**Stationary Equipment Operation:**

<table>
<thead>
<tr>
<th>Min.</th>
<th>Design Center</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater, for Unipotential Cathode:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage (AC or DC)(^*) . . . . . .</td>
<td>6.3</td>
<td>-</td>
</tr>
<tr>
<td>Current at 6.3 volts. . . . . .</td>
<td>1.050</td>
<td>1.200</td>
</tr>
<tr>
<td>Dynamic Grid-No.2 Current(^*) . . . . . .</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Useful Power Output(^*) . . . . . .</td>
<td>59</td>
<td>-</td>
</tr>
</tbody>
</table>

---

\(\wedge\) Obtained preferably from a separate, well-regulated source.

\(\wedge\) Referenced to either of the two tones and without the use of feedback to enhance linearity.

\(\wedge\) Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

\(\wedge\) Obtained from grid-no.1 resistor or from a combination of grid-no.1 resistor with either fixed supply or cathode resistor.

\(\wedge\) When grid no.1 is driven positive and the tube is operated at maximum ratings, the total dc grid-no.1-circuit resistance should not exceed the specified value of 50,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. For operation at less than maximum ratings, the dc grid-no.1-circuit resistance may be as high as 100,000 ohms.

\(\wedge\) Obtained preferably from separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-no.2 resistor should be used only when the tube is used in a circuit which is not keyed. Grid-no.2 voltage must not exceed 35 volts under key-up conditions.

\(\wedge\) Obtained from fixed-supply, by grid-no.1 resistor, by cathode resistor, or by combination methods.
It is recommended that the design-center heater voltage be 6.3 volts; the heater power supply should not fluctuate more than 10% to insure long life.

In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 6.3 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

Mobile Equipment Operation:

<table>
<thead>
<tr>
<th>Heater, for Unipotential Cathode:</th>
<th>Design</th>
<th>Min. Range</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (AC or DC)</td>
<td></td>
<td>6.0-7.5</td>
<td>volts</td>
</tr>
<tr>
<td>Current at 6.75 volts</td>
<td>1.100</td>
<td>1.230</td>
<td>amp</td>
</tr>
<tr>
<td>Dynamic Grid-No.2 Current</td>
<td></td>
<td>15</td>
<td>ma</td>
</tr>
<tr>
<td>Useful Power Output I</td>
<td>59</td>
<td></td>
<td>watts</td>
</tr>
<tr>
<td>Useful Power Output II</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 8 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 11 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 6.75 volts and ±100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 100 microamperes.

With ac or dc heater voltage of 6.75 volts, grid-No.1 volts = -200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 6.75 volts, plate volts = -200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage resistance will be 10 megohms.

It is recommended that the heater voltage operate within the range of 6.0 to 7.5 volts and within excursions from 5 to 8 volts in battery operation. See Useful Power Output Test II and Overvoltage Tests.

In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 6.3 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

With conditions in note (y) above, reduce heater voltage to 5 volts. Useful power output will be at least 90% of the power output at heater voltage of 6.3 volts.

OPERATING CONSIDERATIONS

The maximum bulb temperature of 260° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York 11, N.Y.
To insure adequate cooling it is essential that free circulation of air be provided around the tube. In most cases, no additional air is required.

The plate shows no color when the 6146B/8298A is operated at full ratings under either CCS or ICAS conditions.

Connections to the plate should be made with a flexible lead to prevent any strain on the seal at the cap.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is between 15 minutes and 2 hours. For longer periods, the heater voltage should be turned off.

The maximum-rated plate and grid-No. 2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

![Diagram of tube dimensions](image-url)
TYPICAL PLATE CHARACTERISTICS

E. C = 6.3 VOLTS
GRID-N=2 VOLTS = 200

PLATE MILLIAMPERES

92CM-770TRI

DATA 6
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

2-64
TYPICAL PLATE CHARACTERISTICS

$E_f = 6.3 \text{ VOLTS}$

GRID-NE2 VOLTS = 150
TYPICAL CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-N° 2 VOLTS = 200

GRID-N° 1 MILLIAMPERES

0 100 200 300 400 500 600 700
PLATE VOLTS

GRID-N° 1 VOLTS ECF = 20

GRID-N° 1 MILLIAMPERES

0 20 40 60 80 100 120
PLATE VOLTS

GRID-N° 2 VOLTS ECF = 20

0 20 40 60 80 100 120
PLATE VOLTS
TYPICAL CHARACTERISTICS

$E_p = 6.3 \text{ VOLTS}$
$\text{GRID-NO 2 VOLTS} = 150$

<table>
<thead>
<tr>
<th>PLATE VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

$92CS-9619$

$E_p = 6.3 \text{ VOLTS}$
$\text{GRID-NO 2 VOLTS} = 150$

$92CS-9620$
Beam Power Tube

HIGH POWER SENSITIVITY
RCA "DARK HEATER" WITH 21- TO 31-VOLT RANGE

85 WATTS CW INPUT (ICAS) 50 WATTS CW INPUT (ICAS)
UP TO 60 Mc AT 175 Mc

CONTROLLED ZERO-BIAS
PLATE CURRENT

CONTROLLED POWER OUTPUT
AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an
AF Power Amplifier and Modulator in Both Mobile and
Fixed Equipment. The 6159B is Unilaterally Inter-
changeable with Types 6159, 6159A.

The 6159B is the same as the 6146B/8298A except for the
following items:

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) 26.5 volts
Current at heater volts = 26.5 0.3 amp
Minimum heating time 60 sec
Direct Interelectrode Capacitances:
Grid No.1 to plate 0.24 max. pf

With no external shield.

CHARACTERISTICS RANGE VALUES

Test No. 1
Direct Interelectrode Capacitances:
Grid-No.1 to plate 1 0.24 pf

Note 1: With no external shield.

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

Heater, for Unipotential Cathode:
Voltage (AC or DC) 26.5 volts
Current at 26.5 volts 0.28 amp
Useful Power Output 59 watts

It is recommended that the design-center heater voltage be 26.5 volts;
the heater power supply should not fluctuate more than 10% to insure
long life.

In a single-tube, self-excited oscillator circuit, and with ac heater
voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No.2
voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate
current of 150 max. ma., dc grid-No.1 currant of 2.5 to 3 ma., and
frequency of 15 Mc.
Mobile Equipment Operation:

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Range</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater, for Unipotential Cathode:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage (AC or DC)*</td>
<td>24</td>
<td>29</td>
<td>volts</td>
</tr>
<tr>
<td>Current at 26.5 volts</td>
<td>0.28</td>
<td>-</td>
<td>0.32 amp</td>
</tr>
<tr>
<td>Useful Power Output II</td>
<td>50</td>
<td>-</td>
<td>watts</td>
</tr>
<tr>
<td>Useless Power Output II</td>
<td>See Note 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* It is recommended that the heater voltage operate within the range of 24 to 29 volts and within excursions from 21 to 31 volts in battery operation. See Useful Power Output II and Overvoltage Tests.

** In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 26.5 volts, dc plate voltage of 600 volts, dc grid-No. 2 voltage of 200 volts, grid-No. 1 resistor of 24,000 ± 10% ohms, dc plate current of 150 ma., ma., dc grid-No. 1 current of 2.5 to 3 ma., and frequency of 15 Mc.

With conditions in note (y) above, reduce heater voltage to 21 volts. Useful power output will be at least 90% of the power output at heater voltage of 26.5 volts.

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 31 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 43 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 26.5 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 150 microamperes.

With ac or dc heater voltage of 26.5 volts, grid-No. 1 volts = -200 and cathode, grid No. 2, and plate grounded, the minimum grid-No. 1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 26.5 volts, plate volts = -200, and cathode grid No. 1 and grid No. 2 grounded, the minimum plate leakage will be 10 megohms.
Beam Power Tube

HIGH POWER SENSITIVITY

90 WATTS CW INPUT (ICAS) UP TO 60 Mc
60 WATTS CW INPUT (ICAS) AT 175 Mc

For Use Under Severe Shock and Vibration

The 6159W/7357 is the same as the 6146W/7212 except for the following items:

Heater, for Unipotential Cathode:
Voltage (AC or DC) ........... 26.5 ± 10% volts
Current at heater volts = 26.5 .... 0.3 amp

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.280</td>
<td>0.320</td>
</tr>
</tbody>
</table>

Note 1: With 26.5 volts on heater.
The 6161 supersedes type 5588 for new equipment design.

**GENERAL DATA**

**Electrical:**
Heater, for Unipotential Cathode:
- Voltage: 6.3 av. ac or dc volts
- Current at 6.3 volts: 3.4 amp
- Minimum heating time at 6.3 volts: 1 minute

**Amplification Factor for grid volts = -15, and plate ma. = 250:** 25

**Direct Inter-electrode Capacitances:**
- Grid to plate: 6 µuf
- Grid to cathode and heater: 11 µuf
- Plate to cathode and heater: 0.19 µuf

**Mechanical:**
- Operating Position: Any
- Overall Length: 3-5/16" ± 3/32"
- Greatest Diameter: 1.750" ± 0.010"
- Weight (Approx.): 8 oz
- Radiator: Integral part of tube
- Mounting: Special

**Terminal Connections (See Dimensional Outline):**

**Air Flow:**
The specified air flow for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower onto the respective terminals and seals, and through the radiator before and during the application of any voltages. Heater power, plate power, and air may be removed simultaneously.

<table>
<thead>
<tr>
<th>Percentage of maximum-rated plate dissipation</th>
<th>100</th>
<th>80</th>
<th>60</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum air flow</td>
<td>16</td>
<td>10</td>
<td>5.7</td>
<td>cfm</td>
</tr>
<tr>
<td>Static pressure</td>
<td>0.85</td>
<td>0.4</td>
<td>0.18</td>
<td>In. of water</td>
</tr>
</tbody>
</table>

*§: Indicates a change.

6161
POWER TRIODE
FORCED-AIR COOLED
Useful with full input up to 900 Mc
and with reduced input up to 2000 Mc
The above flow and pressure values are for condition with radiator temperature held constant at 135° C rise above incoming-air temperature. The air flow must be adequate to limit the temperature of the radiator, grid terminal, cathode terminal, and seals to their respective maximum values.

Radiator Temperature (Measured on core at end adjacent to plate flange) 180 max. °C
Grid-Terminal Temperature 150 max. °C
Cathode-Terminal Temperature 150 max. °C
Seal Temperature (Plate, grid, and cathode) 150 max. °C

RF POWER AMPLIFIER — Class B Television Service

Maximum CCs* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1600 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.350 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT:</td>
<td></td>
</tr>
<tr>
<td>Negative value</td>
<td>0.010 max. amp</td>
</tr>
<tr>
<td>Positive value</td>
<td>0.100 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>560 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>250 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit at 600 Mc:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1600 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>100 volts</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>130 volts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>117 volts</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.350 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.285 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.040 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.013 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>65# watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>40 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>89 %</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>325** watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>195** watts</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit at 900 Mc:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1600 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>100 volts</td>
</tr>
</tbody>
</table>
### 6161 POWER TRIODE

**Peak RF Cathode-to-Grid Voltage:**
- Synchronizing level: 135 volts
- Pedestal level: 120 volts

**DC Plate Current:**
- Synchronizing level: 0.350 amp
- Pedestal level: 0.280 amp

**DC Grid Current (Approx.):**
- Synchronizing level: 0.030 amp
- Pedestal level: 0.010 amp

**Driver Power Output (Approx.):**
- Synchronizing level: 75 watts
- Pedestal level: 45 watts

**Output-Circuit Efficiency (Approx.):**
- Synchronizing level: 65%

**Useful Power Output (Approx.):**
- Synchronizing level: 230 watts
- Pedestal level: 135 watts

---

**BIAS-MODULATED RF POWER AMPLIFIER**
**Class C Television Service**

_Synchronizing-level conditions per tube unless otherwise specified_

**Maximum CCS Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1600 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE (White level)</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.350 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td></td>
</tr>
<tr>
<td>Negative value</td>
<td>0.010 max. amp</td>
</tr>
<tr>
<td>Positive value</td>
<td>0.100 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>560 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>250 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation in Cathode-Drive Circuit at 600 Mc:**

_Bandwidth of 6 Mc_

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1600 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>100 volts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>150 volts</td>
</tr>
<tr>
<td>White level</td>
<td>230 volts</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage</td>
<td>130 volts</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.350 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.250 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.040 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.013 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>65 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.):</td>
<td>89 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>325 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>195 watts</td>
</tr>
</tbody>
</table>

See next page.
Typical Operation in Cathode-Drive Circuit at 900 Mc:

<table>
<thead>
<tr>
<th>Bandwidth of 6 Mc</th>
<th>DC Plate-to-Grid Voltage</th>
<th>1400</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Cathode-to-Grid Voltage:</td>
<td>Synchronizing level</td>
<td>100</td>
<td>volts</td>
</tr>
<tr>
<td></td>
<td>Pedestal level</td>
<td>150</td>
<td>volts</td>
</tr>
<tr>
<td></td>
<td>White level</td>
<td>230</td>
<td>volts</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage</td>
<td>135</td>
<td>volts</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td>Synchronizing level</td>
<td>0.350</td>
<td>amp</td>
</tr>
<tr>
<td></td>
<td>Pedestal level</td>
<td>0.250</td>
<td>amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.):</td>
<td>Synchronizing level</td>
<td>0.030</td>
<td>amp</td>
</tr>
<tr>
<td></td>
<td>Pedestal level</td>
<td>0.010</td>
<td>amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td>Synchronizing level</td>
<td>75°</td>
<td>watts</td>
</tr>
<tr>
<td></td>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>65%</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td>Synchronizing level</td>
<td>230°</td>
<td>watts</td>
</tr>
<tr>
<td></td>
<td>Pedestal level</td>
<td>135°</td>
<td>watts</td>
</tr>
</tbody>
</table>

PLATE-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 Values:

| DC PLATE VOLTAGE | 1300 max. volts |
| DC GRID VOLTAGE | -300 max. volts |
| DC PLATE CURRENT | 0.210 max. amp |
| DC GRID CURRENT | See Rating Chart |
| PLATE INPUT | 270 max. watts |
| PLATE DISSIPATION | 167 max. watts |

Typical Operation in Cathode-Drive Circuit at 600 Mc:

| DC Plate-to-Grid Voltage | 1400 | volts |
| DC Cathode-to-Grid Voltage | 150 | volts |
| Peak RF Cathode-to-Grid Voltage | 200 | volts |
| DC Plate Current | 0.210 | amp |
| DC Grid Current (Approx.) | 0.070 | amp |
| Driver Power Output (Approx.) | 70° | watts |
| Output-Circuit Efficiency (Approx.) | 80% |
| Useful Power Output (Approx.) | 180° | watts |

Typical Operation in Cathode-Drive Circuit at 900 Mc:

| DC Plate-to-Grid Voltage | 1400 | volts |
| DC Cathode-to-Grid Voltage | 150 | volts |
| Peak RF Cathode-to-Grid Voltage | 200 | volts |
| DC Plate Current | 0.210 | amp |
| DC Grid Current (Approx.) | 0.070 | amp |
| Driver Power Output (Approx.) | 75° | watts |
**POWER TRIODE**

Output-Circuit Efficiency (Approx.)... 60 %
Useful Power Output (Approx.)..... 120** watts

**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy**

**RF POWER AMPLIFIER — Class C FM Telephony**

Maximum CCS® Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1600 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.250 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>250 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation as Amplifier in Cathode-Drive Circuit at 600 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1650 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td></td>
</tr>
<tr>
<td>From fixed supply of</td>
<td>150 volts</td>
</tr>
<tr>
<td>From cathode resistor of</td>
<td>500 ohms</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage</td>
<td>200 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.250 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.050 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>75° watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>82 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>270** watts</td>
</tr>
</tbody>
</table>

**Typical Operation as Amplifier in Cathode-Drive Circuit at 900 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1650 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td></td>
</tr>
<tr>
<td>From fixed supply of</td>
<td>150 volts</td>
</tr>
<tr>
<td>From cathode resistor of</td>
<td>575 ohms</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage</td>
<td>200 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.250 amp</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.010 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>80° watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>60 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>180** watts</td>
</tr>
</tbody>
</table>

**FREQUENCY MULTIPLIER — Class C**

Maximum CCS® Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1600 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.250 max. amp</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>250 max. watts</td>
</tr>
</tbody>
</table>

*• Indicates a change.*

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
Typical Operation in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th></th>
<th>Doubler to 600 Nc</th>
<th>Doubler to 900 Nc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>1760</td>
<td>1675</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From fixed supply of.</td>
<td>260</td>
<td>175</td>
</tr>
<tr>
<td>From cathode resistor of.</td>
<td>860</td>
<td>645</td>
</tr>
<tr>
<td>Peak RF Cathode-to-Grid Voltage</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.250</td>
<td>0.250</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>0.050</td>
<td>0.021</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>125</td>
<td>100</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>180**</td>
<td>140**</td>
</tr>
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</table>

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
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<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>3.05</td>
<td>3.75</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.2</td>
<td>18</td>
<td>32</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>-</td>
<td>5.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Grid to cathode and heater</td>
<td>-</td>
<td>10.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Plate to cathode and heater</td>
<td>3</td>
<td>0.12</td>
<td>0.26</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1.4</td>
<td>500</td>
<td>850</td>
</tr>
<tr>
<td>Plate Voltage</td>
<td>1.5</td>
<td>690</td>
<td>1140</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>1.6</td>
<td>-</td>
<td>-165</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>1.7</td>
<td>3.2</td>
<td>-</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>1.8</td>
<td>225</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac on heater.
Note 2: With dc grid volts = -15, and dc plate voltage adjusted to give dc plate current of 250 ma.
Note 3: With external shield, as described under (9), connected to grid terminal.
Note 4: With dc grid volts = -10, and dc plate voltage adjusted to give dc plate current of 250 ma.
Note 5: With dc grid volts = -20, and dc plate voltage adjusted to give dc plate current of 250 ma.
Note 6: With dc plate volts = 1600, and dc grid voltage adjusted to give dc plate current of 1 ma.
Note 7: Designers should limit the maximum useable cathode current (plate current and grid current) to this value under any condition of operation.
Note 8: In a self-excited oscillator circuit with dc plate volts = 1600, dc plate ma. = 250, dc grid ma. = 50 to 75, grid resistor (ohms) = 2000 ± 10%, and frequency (Mc) = 15.

See next page. — Indicates a change.
POWER TRIODE

Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

Without external shield.

With external flat shield 7-1/2" min. diameter located in plane of the grid terminal and perpendicular to axis of tube. Shield is connected to grid terminal.

Continuous Commercial Service.

Compressed between half-power points and based on tube output capacitance only.

The driver stage is required to supply tube losses, rf-circuit losses, and rf power added to plate input. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

This value includes 24 watts of circuit loss and 36 watts added to plate input.

This value of useful power is measured at load of output circuit having indicated efficiency.

This value includes 28 watts of circuit loss and 40 watts added to plate input.

In cathode-drive, plate-modulated class C rf power amplifier service, the 515 can be modulated 100% if the rf driver stage is also modulated 100% simultaneously. Care should be taken to insure that the driver-modulation and amplifier-modulation voltages are exactly in phase.

This value includes 18 watts of circuit loss and 40 watts added to plate input.

This value includes 23 watts of circuit loss and 40 watts added to plate input.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

This value includes 18 watts of circuit loss and 45 watts added to plate input.

This value includes 29 watts of circuit loss and 45 watts added to plate input.

MAXIMUM RATINGS vs OPERATING FREQUENCY

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>900</th>
<th>1200</th>
<th>1400</th>
<th>1650</th>
<th>2000</th>
<th>Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX.—PERMISSIBLE PERCENTAGE OF MAX.—RATED PLATE VOLTAGE AND PLATE INPUT:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B television</td>
<td>100</td>
<td>80</td>
<td>71</td>
<td>62.5</td>
<td>62.5</td>
<td>%</td>
</tr>
<tr>
<td>Class C television, biased-modulated</td>
<td>100</td>
<td>80</td>
<td>71</td>
<td>62.5</td>
<td>62.5</td>
<td>%</td>
</tr>
<tr>
<td>Class C telephony, plate-modulated</td>
<td>100</td>
<td>80</td>
<td>71</td>
<td>62.5</td>
<td>62.5</td>
<td>%</td>
</tr>
<tr>
<td>Class C telegraphy</td>
<td>100</td>
<td>80</td>
<td>71</td>
<td>62.5</td>
<td>62.5</td>
<td>%</td>
</tr>
<tr>
<td>Class C FM telephony</td>
<td>100</td>
<td>80</td>
<td>71</td>
<td>62.5</td>
<td>62.5</td>
<td>%</td>
</tr>
</tbody>
</table>
POWER TRIODE

OPERATING CONSIDERATIONS

In tuning a cathode-drive rf amplifier, it must be remembered that variations in the load on the output stage will produce corresponding variations in the load on the driving stage. This effect will be noticed by the simultaneous increase in plate currents of both the output and driving stages.

During standby periods of less than 15 minutes, it is recommended that the heater voltage be reduced to 80% of normal to conserve life; for longer standby periods, the heater power should be turned off.

---

**Diagram Description**

- **Air-Cooled Radiator**
- **Plate Flange**
- **Plate Contact Surface**
- **Grid Terminal**
- **Cathode and Heater Terminal**
- **Heater Terminal**

**Dimensions**

- Diameter: 1 1/2 ± 1/64" DIA.
- Notes: SEE NOTE 3
- Diameter: 3 5/16" ± 3/32" DIA.
- Diameter: 2 1/16" ± 1/16" DIA.
- Diameter: 3/4" ± 1/32" DIA.
- Diameter: 1/16" DIA.
- Diameter: 0.059" ± 0.002" to 0.006" DIA.
- Diameter: 0.370" MIN. DIA.
- Diameter: 1 1/8 MAX. DIA.

---

*Note: Indicates a change.*

DATA 4

RAM CORPORATION OF AMERICA, HARRISON, NEW JERSEY & CE-7704R2A
NOTE 1: WITH THE CYLINDRICAL SURFACES OF ITS GRID AND CATHODE TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₂. THE FOUR CYLINDRICAL HOLES H₁, H₂, H₃, and H₄ HAVE AXES COINCIDENT WITHIN 0.0005", LENGTHS DETERMINED FROM THE DIMENSIONAL OUTLINE, AND SUCCESSIVELY SMALLER DIAMETERS AS SHOWN IN THE SKETCH.

THE PLATE FLANGE WILL BE ENTIRELY ENGAGED BY HOLE H₁, AND THE CONTACT SURFACE OF THE PLATE FLANGE WILL SEAT ON THE SHOULDER BETWEEN HOLES H₁ AND H₂. THE PLANE SURFACE OF THIS SHOULDER IS 90° ± 2° TO THE AXES OF THE HOLES. SEATING IS DETERMINED BY FAILURE OF A 0.005"-THICKNESS GAUGE, 1/8" WIDE, TO ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE PLATE CONTACT SURFACE.

WITH THE TUBE PROPERLY SEATED AS DESCRIBED ABOVE, THE GRID TERMINAL WILL BE ENTIRELY ENGAGED BY HOLE H₂, AND THE CATHODE TERMINAL WILL BE ENGAGED BY HOLE H₄ TO A DEPTH OF AT LEAST 1/4".

NOTE 2: CONCENTRICITY OF THE HEATER TERMINAL WITH RESPECT TO THE CATHODE TERMINAL IS DETERMINED BY A GAUGE AS SHOWN IN SKETCH G₂. THE CYLINDRICAL HOLE H₅ AND THE ANNULAR HOLE H₆ HAVE AXES COINCIDENT WITHIN 0.0005". THE CATHODE TERMINAL AND THE HEATER TERMINAL WILL ENTER THIS GAUGE TO A DEPTH OF 3/8".

NOTE 3: MAY BE ROUNDED OR BEVELED NOT TO EXCEED 1/16".

NOTE 4: THE AVERAGE OF THE MINIMUM DIAMETER AND THAT MEASURED 90° FROM THE MINIMUM WILL BE WITHIN THE SPECIFIED RANGE, AND THE DIFFERENCE BETWEEN THESE TWO MEASUREMENTS WILL NOT EXCEED .010".
MOUNTING ARRANGEMENT FOR USE WITH COAXIAL-LINE-OR CAVITY CIRCUITS

PLATE FLANGE

AIR-COOLED RADIATOR

1.600" MIN.

REMOVABLE CLAMP C

1.560" MIN.

PLATE CONTACT SURFACE

1.800" MIN.

92C5-6833R2

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
SHADOWED AREA SHOWS RANGE OF RATED GRID CURRENT VS OPERATING FREQUENCY.
E.f = 6.3 VOLTS
PLATE & CATHODE VOLTAGES ARE REFERRED TO GRID.
Beam Power Tube

FORCED-AIR COOLED COAXIAL-ELECTRODE STRUCTURE
THORIATED-TUNGSTEN FILAMENT INTEGRAL RADIATOR
10-KW PLATE DISSIPATION IN CW OR TV SERVICE UP TO 220 Mc

GENERAL DATA

Electrical:
Filament, Multistrand Thoriated Tungsten:
Voltage (AC or DC)\(^a\) .................. 5 ± 5\% volts
Current at 5 volts. .................. 181 amp
Minimum heating time. ............. 15 sec
Cold resistance .................. 0.0038 ohm
Mu Factor, Grid No.2 to Grid No.1
for plate volts = 2000, grid-No.2
volts = 1000, and plate amperes = 2.. 10
Direct Interelectrode Capacitances:
Grid No.1 to plate\(^b\) .................. 0.6 max. \(\mu f\)
Grid No.1 to filament .................. 42 \(\mu f\)
Plate to filament\(^b\) .................. 0.08 max. \(\mu f\)
Grid No.1 to grid No.2 .................. 60 \(\mu f\)
Grid No.2 to plate .................. 24 \(\mu f\)

Mechanical:
Operating Position. ............. Vertical, filament end up or down
Maximum Overall Length. ............. 11.63\"
Maximum Diameter. .................. 6.38\"
Weight (Approx.). .................. 15 lbs
Radiator. .................. Integral part of tube
Terminal Connections (See Dimensional Outline):

\[ \begin{align*}
G_1 & - \text{Grid No.1} \\
G_2 & - \text{Grid No.2} \\
P & - \text{Plate} \\
F & - \text{Filament}
\end{align*} \]

Air Flow:
Through radiator—The specified flow of incoming air at a
temperature of 45\(^\circ\) C for various plate dissipations, as
indicated in the tabulation below, should be delivered by
a blower through the radiator before and during the
application of any voltages. The air should enter the
radiator at its plate-terminal end (See Dimensional
Outline). Filament power, plate power, grid-No.2 power,
and air flow may be removed simultaneously.

Percentage of maximum-rated plate dissipation for each
class of service. .................. 100 80 60 \%
Minimum air flow. ............. 350 270 200 cfm
Static pressure .................. 3 2.1 1.3 In. of water

\(^a\) Indicates a change.
To grid-No.2 terminal .......................... 50 min.  cfm
To grid-No.1 terminal
and filament terminals .......................... 50 min.  cfm
Incoming-Air Temperature ........................ 45 max.  °C
Radiator Temperature (Measured on the
core at end away from incoming air) ........ 180 max.  °C
Glass Temperature (At hottest point) ......... 180 max.  °C
Seal Temperature:
Filament, grid No.1, grid
No.2, and plate ............................... 180 max.  °C

**RF POWER AMPLIFIER — Class B Television Service**

*Synchronizing-level conditions per
tube unless otherwise specified*

(Voltages are referred to cathode unless otherwise specified)

Maximum 
CCS vol.

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>54 to 216 Mc</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>6000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>4 max. amp</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>22000 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>GRID-No.1 (CONTROL-GRID) DISSIPATION</td>
<td>10000 max. watts</td>
</tr>
<tr>
<td></td>
<td>300 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation in Grid-Drive Circuit at 216 Mc:**

*Bandwidth of 8.5 Mc*

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-130 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>375 volts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>290 volts</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>3.45 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>2.6 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Pedestal level)</td>
<td>0.207 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.175 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.085 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>800 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>450 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>12000 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>6800 watts</td>
</tr>
</tbody>
</table>

**Typical Operation in Cathode-Drive Circuit at 216 Mc**

*Bandwidth of 8.5 Mc*

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid-No.1 Voltage</td>
<td>5885 volts</td>
</tr>
<tr>
<td>DC Grid-No.2-to-Grid-No.1 Voltage</td>
<td>885 volts</td>
</tr>
</tbody>
</table>

→ Indicates a change.
DC Cathode-to-Grid-No.1 Voltage........ 85 volts
Peak RF Cathode-to-Grid-No.1 Voltage:
  Synchronizing level ............ 330 volts
  Pedestal level ................. 260 volts
DC Plate Current:
  Synchronizing level .......... 3.45 amp
  Pedestal level ............... 2.6 amp
DC Grid-No.2 Current (Pedestal level) . 0.152 amp
DC Grid-No.1 Current (Approx.):
  Synchronizing level .......... 0.202 amp
  Pedestal level ............... 0.11 amp
Driver Power Output (Approx.):
  Synchronizing level .......... 1300 watts
  Pedestal level ............... 700 watts
Useful Power Output (Approx.):
  Synchronizing level .......... 12000 watts
  Pedestal level ............... 6800 watts

GRID-MODULATED RF POWER AMPLIFIER
Class C Television Service
Synchronizing-Level conditions per tube unless otherwise specified

Maximum CCS° Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Synchronizing level</th>
<th>Pedestal level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>6000 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>2000 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE (White level)</td>
<td>-1000 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>4 max. amp</td>
<td></td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>22000 max. watts</td>
<td></td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>400 max. watts</td>
<td></td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>10000 max. watts</td>
<td></td>
</tr>
<tr>
<td>GRID-No.1 DISSIPATION</td>
<td>300 max. watts</td>
<td></td>
</tr>
</tbody>
</table>

Typical Operation in Grid-Drive Circuit at 216 Mc:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Synchronizing level</th>
<th>Pedestal level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5800 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>-130 volts</td>
<td></td>
</tr>
<tr>
<td>Pedestal level</td>
<td>-195 volts</td>
<td></td>
</tr>
<tr>
<td>White level</td>
<td>-350 volts</td>
<td></td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>375 volts</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>3.45 amp</td>
<td></td>
</tr>
<tr>
<td>Pedestal level</td>
<td>2.42 amp</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Pedestal level)</td>
<td>0.148 amp</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.175 amp</td>
<td></td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.098 amp</td>
<td></td>
</tr>
</tbody>
</table>

Indicates a change.
**Bandwidth of 8.5 Mc**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>8009 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>425 watts</td>
</tr>
<tr>
<td>Useless Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>12000 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>6800 watts</td>
</tr>
</tbody>
</table>

**LINEAR RF POWER AMPLIFIER**

*Single-Sideband Suppressed-Carrier Service*

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>6900 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT.</td>
<td>2.75 max. amp</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID-No.1 (CONTROL-GRID) CURRENT.</td>
<td>0.6 max. amp</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT</td>
<td>18000 max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>10000 max. watts</td>
</tr>
</tbody>
</table>

**Typical CCS Class AB₁ and AB₂ "Single-Tone" Operation at 60 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB₁ DC PLATE VOLTAGE</td>
<td>6900 volts</td>
</tr>
<tr>
<td>AB₁ DC GRID-No.2 Voltage</td>
<td>1200 volts</td>
</tr>
<tr>
<td>AB₁ DC GRID-No.1 Voltage</td>
<td>-125 volts</td>
</tr>
<tr>
<td>AB₁ Zero-Signal DC Plate Current</td>
<td>0.2 amp</td>
</tr>
<tr>
<td>AB₁ Zero-Signal DC Grid-No.2 Current</td>
<td>0 amp</td>
</tr>
<tr>
<td>AB₁ Effective RF Load Resistance</td>
<td>5400 ohms</td>
</tr>
<tr>
<td>AB₁ Max.-Signal DC Plate Current</td>
<td>0.675 amp</td>
</tr>
<tr>
<td>AB₁ Max.-Signal DC Grid-No.2 Current</td>
<td>0.035 amp</td>
</tr>
<tr>
<td>AB₁ Max.-Signal DC Grid-No.1 Current</td>
<td>0 amp</td>
</tr>
<tr>
<td>AB₁ Max.-Signal Peak RF Grid-No.1 Voltage</td>
<td>125 volts</td>
</tr>
<tr>
<td>AB₁ Max.-Signal Driving Power (Approx.)</td>
<td>0 watts</td>
</tr>
<tr>
<td>AB₁ Max.-Signal Power Output (Approx.)</td>
<td>2920 watts</td>
</tr>
</tbody>
</table>

**PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony**

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

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>5000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-1000 volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>2 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.6 max. amp</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>10000 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>6600 max. watts</td>
</tr>
</tbody>
</table>

*Indicates a change.*
Typical Operation in Grid-Drive Circuit:

<table>
<thead>
<tr>
<th></th>
<th>Up to 60 Mc</th>
<th>At 216 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>4700 volts</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage (Modulated 100%)</td>
<td>800 volts</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-280 volts</td>
<td>-130 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>485 volts</td>
<td>370 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.56 amp</td>
<td>1.8 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.217 amp</td>
<td>0.1 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.15 amp</td>
<td>0.11 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>180* watts</td>
<td>300* watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>5500 watts</td>
<td>750* watts</td>
</tr>
</tbody>
</table>

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>Max.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>6900 volts</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000 volts</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-1000 volts</td>
<td>-175 volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT.</td>
<td>2.75 max. amp</td>
<td>2.6 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.6 max. amp</td>
<td>0.14 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT.</td>
<td>18000 max. watts</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT.</td>
<td>10000 max. watts</td>
<td></td>
</tr>
<tr>
<td>PLATE DISSIPATION.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Typical Operation in Grid-Drive Circuit:

<table>
<thead>
<tr>
<th></th>
<th>Up to 60 Mc</th>
<th>At 216 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6400 volts</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200 volts</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-310 volts</td>
<td>-130 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>560 volts</td>
<td>370 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.75 amp</td>
<td>2.6 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.3 amp</td>
<td>0.14 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.1 amp</td>
<td>0.11 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>75 watts</td>
<td>300 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>11600 watts</td>
<td>750 watts</td>
</tr>
</tbody>
</table>

a Full rated filament voltage can be applied safely to the cold filament. It is not necessary to provide means for limiting the filament starting current.

b With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.

c Continuous Commercial Service.

d For operation on VHF television channels 2 through 6, DC plate voltage may be increased to 6400 max. volts and plate input may be increased to 24000 maximum watts provided all other ratings are net.

e Computed between half-power points and based on tube output capacitance only.

f The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

g This value includes 700 watts of rf circuit loss at 216 Mc.

* Indicates a change.
The driver stage is required to supply tube losses, rf circuit losses, and rf power added to plate circuit. The driver stage should be designed as indicated under (f).

This value includes 300 watts of rf circuit loss at 216 Mc, and 900 watts added to plate circuit.

"Single-Tone Modulation" operation refers to that class of amplifier service in which the grid-no.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

Adjust to give indicated zero-signal plate current.

These ratings hold for operation up to 60 Mc; for ratings at higher frequencies, see Maximum Ratings vs Operating Frequency table.

Obtained preferably from a separate source.

Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-no.2 resistor should not be used if the 6166 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-no.2 voltage from rising above 2000 volts under key-up conditions; and additional fixed grid-no.1 bias must be provided to limit the plate current.

Obtained from fixed supply, by grid-no.1 resistor, by cathode resistor, or by combination methods.

This value includes 270 watts of rf circuit loss.

This value includes 675 watts of rf circuit loss.

**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>172</td>
<td>190 amp</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.6 μf</td>
</tr>
<tr>
<td>Grid No.1 to filament</td>
<td>3</td>
<td>30</td>
<td>47 μf</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>3</td>
<td>52</td>
<td>64 μf</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>21.2</td>
<td>25.8</td>
<td></td>
</tr>
<tr>
<td>Plate to filament</td>
<td>2</td>
<td>-</td>
<td>0.08 μf</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>1,4</td>
<td>-</td>
<td>-225 volts</td>
</tr>
<tr>
<td>Peak Grid-No.1 Current</td>
<td>1,5</td>
<td>-</td>
<td>1.5 amp</td>
</tr>
<tr>
<td>Peak Grid-No.1 Voltage</td>
<td>1,5</td>
<td>-</td>
<td>315 volts</td>
</tr>
</tbody>
</table>

**Note 1:** With 5 volts ac or dc on filament.

**Note 2:** With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-no.2 terminal, perpendicular to the tube axis, and is connected to grid-no.2. All other electrodes are grounded.

**Note 3:** Without shield and all other electrodes grounded.

**Note 4:** With dc plate voltage of 6000 volts, dc grid-no.2 voltage of 1200 volts, and dc plate current of 20 ma.

**Note 5:** With dc plate voltage of 1500 volts, dc grid-no.2 voltage of 750 volts, and instantaneous grid-no.1 voltage adjusted to give peak plate current of 11 amp.

--- Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
### Maximum Ratings vs Operating Frequency

<table>
<thead>
<tr>
<th>Frequency</th>
<th>60</th>
<th>220</th>
<th>Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class AB Single-Sideband Suppressed-Carrier Service</td>
<td>100</td>
<td>90</td>
<td>%</td>
</tr>
<tr>
<td>Class B Television Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C Television Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class C Telephony, Plate-Modulated</td>
<td>100</td>
<td>90</td>
<td>%</td>
</tr>
<tr>
<td>Class C Telegraphy and FM Telephony</td>
<td>100</td>
<td>90</td>
<td>%</td>
</tr>
</tbody>
</table>

**Maximum Permissible Percentage of Maximum-Rated Plate Voltage and Plate Input:**

Class AB Single-Sideband Suppressed-Carrier Service

Class B Television Service

Class C Television Service

Class C Telephony, Plate-Modulated

Class C Telegraphy and FM Telephony

### Diagram

- **Handle**: 6.0 ± 0.1
- **Air-Cooled Radiator**: 3.38 MAX.
- **Plate**: 6.36 ± 0.02
- **Plate Ring**: 5 MAX.
- **Grid-№2 Terminal Contact Surface**: 4.246 ± 0.020
- **Grid-№1 Terminal Contact Surface**: 3.686 ± 0.024
- **Filament Terminals**: 1.71 ± 0.04

---

*Indicates a change.*

---

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 4
5-61
WITH THE CYLINDRICAL SURFACES OF THE GRID-No.2 TERMINAL, GRID-No.1 TERMINAL AND THE FILAMENT TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G₁. THE FIVE CYLINDRICAL HOLES H₁, H₂, H₃, H₄, AND H₅ HAVE AXES THAT ARE COINCIDENT WITHIN 0.001" AND HAVE SUCCESSIVELY SMALLER DIAMETERS AS SHOWN. THE CENTER HOLES H₆ AND H₇ ARE LOCATED ON A DIAMETER WITHIN ± 0.001" AND THEIR AXES ARE PARALLEL TO THE AXES OF H₁, H₂, H₃, H₄, AND H₅ WITHIN 0° ± 2'.

THE PLATE RING WILL BE ENTIRELY ENGAGED BY HOLE H₁ AND WILL SEAT ON THE SHOULDER BETWEEN H₁ AND H₂. THE PLANE SURFACE OF THIS SHOULDER IS AT RIGHT ANGLES TO THE AXES OF THE HOLES WITHIN 0° ± 2'. SEATING IS DETERMINED BY FAILURE OF A 0.020" THICKNESS GAUGE TO ENTER MORE THAN 1/16" BETWEEN SHOULDER SURFACE AND PLATE RING. SLOTS ARE PROVIDED TO PERMIT THIS MEASUREMENT.
COOLING REQUIREMENTS

\[ E_f = 5 \text{ VOLTS AC} \]

MAXIMUM RADIATOR TEMPERATURE = 180° C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PRESSURE DROP—INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.3</td>
</tr>
<tr>
<td>B</td>
<td>1.6</td>
</tr>
<tr>
<td>C</td>
<td>2.4</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>3.7</td>
</tr>
<tr>
<td>F</td>
<td>4.5</td>
</tr>
</tbody>
</table>

CURVES TAKEN ACCORDING TO NAFASTAROS—BULLETIN NO 103

*
NATIONAL ASSOCIATION OF
FAN MFGS., GENERAL MOTORS
BLDG., DETROIT, MICH.

MAXIMUM ALLOWABLE
TEMPERATURE RISE WITH
INCOMING—AIR TEMPERATURE
OF 45° C

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CHARACTERISTICS

$E_f = 5 \text{ VOLTS AC}$
GRID-N$\#2 \text{ VOLTS} = 800$

GRID-N$\#1 \text{ VOLTS} E_C = -400$

GRID-N$\#2 \text{ VOLTS} E_C = -400$

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 6
5-61
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

Grid-1 Volts

Grid-2 Volts

Plate Volts

E_2 = 5 VOLTS AC
GRID-NR 2 VOLTS = 800
AVERAGE CHARACTERISTICS

$E_C = 5 \text{ VOLTS AC}$
$\text{GRID-NR}_2 \text{ VOLTS} = 1200$

GRID-NR1 VOLTS $E_C = +400$
+350
+300
+250
+200
+150
+100
+50

PLATE VOLTS
0 1000 2000 3000 4000 5000

GRID-NR1 AMPERES
0 0.5 1 1.5 2 2.5 3
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

GRID-NR1 VOLTS

PLATE AMPERES = 16

GRID-NR2 VOLT S = 1200

EF = 5 VOLTS AC

400 300 200 100 0 -100 -200

2000 3000 4000 5000 6000 7000

GRID-NR1 VOLTS

92CM-7733RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 9
5-61
AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service

$E_p = 5 \text{ VOLTS AC}$
GRID-\#2 TO GRID-\#1 VOLTS = 890

PLATE AMPERES

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CHARACTERISTICS
Cathode-Drive Service

\[ E_f = 5 \text{ VOLTS AC} \]
GRID-N\#2-TO-GRID-N\#1 VOLTS = 890

\[ E_f = 5 \text{ VOLTS AC} \]
GRID-N\#2-TO-GRID-N\#1 VOLTS = 890

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS

THORIATED-TUNGSTEN FILAMENT

COAXIAL-ELECTRODE STRUCTURE

INTEGRAL RADIATOR

12-KW PLATE DISSIPATION IN CW OR TV SERVICE UP TO 220 Mc

Electrical:

Filament, Multistrand Thoriated Tungsten:
- Voltage (AC or DC)\(^*\) \(5 \pm 5\%\) volts
- Current at heater volts = 5 \(168\) amp
- Minimum heating time. \(15\) sec
- Cold resistance \(0.0038\) ohm
- Mu Factor, Grid No.2 to Grid No.1: for plate volts = 2000, grid-No.2 volts = 1000, and plate amperes= 2 \(10\)

Direct Interelectrode Capacitances:
- Grid No.1 to plate \(0.6\) max. \(\mu\)f
- Grid No.1 to filament \(42\) \(\mu\)f
- Plate to filament \(0.08\) max. \(\mu\)f
- Grid No.1 to grid No.2 \(65\) \(\mu\)f
- Grid No.2 to plate \(22\) \(\mu\)f

Mechanical:

Operating Position. Vertical, filament end up or down
- Maximum Overall Length \(11.50\)"
- Maximum Diameter \(6.38\)"
- Weight (Approx.) \(15\) lbs
- Radiator. Integral part of tube

Terminal Diagram (See Dimensional Outline):

\[ P - \text{Plate} \]
\[ F - \text{Filament} \]
\[ G_1 - \text{Grid No.1} \]
\[ G_2 - \text{Grid No.2} \]

Thermal:

Air Flow:

Through radiator—The specified flow of incoming air at a temperature of 45\(^\circ\) C for various plate dissipations, as indicated in the tabulation below, should be delivered by a blower through the radiator before and during the application of any voltages. The air should enter the radiator at its plate-terminal end (See Dimensional Outline). Filament power, plate power, grid-No.2 power, and air flow may be removed simultaneously.

- Percentage of maximum-rated plate dissipation for each class of service: \(100\) \(83\) \(67\) \(50\) \(\%\)
- Minimum air flow. \(550\) \(350\) \(230\) \(175\) cfm
- Static pressure. \(6.6\) \(3.16\) \(1\) in. of water

\(^*\) indicates a change.
To grid-No.2 terminal ........................................ 50 min. cfm
To grid-No.1 terminal and filament terminals ................ 50 min. cfm
Incoming-Air Temperature ..................................... 50 max. °C
Radiation Temperature (Measured on the
cure at end away from incoming air) ....................... 180 max. °C
Terminal Temperature:
Filament, grid No.1, grid No.2, and plate ................. 180 max. °C

RF POWER AMPLIFIER — Class B Television Service

Synchronizing-level conditions per
tube unless otherwise specified

(Voltages are referred to cathode unless otherwise specified)

Maximum CCS* Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>4 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>24000 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>12000 max. watts</td>
</tr>
<tr>
<td>GRID-No.1 DISSIPATION</td>
<td>300 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation in Grid-Drive Circuit at 216 Mc:

Bandwidth of 8.5 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate voltage</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-130 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>375 volts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>290 volts</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>3.45 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>2.6 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Pedestal Level)</td>
<td>0.207 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.175 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.085 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>900 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>450 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>12000 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>6800 watts</td>
</tr>
</tbody>
</table>

Typical Operation in Cathode-Drive Circuit at 216 Mc:

Bandwidth of 8.5 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid-No.1 Voltage</td>
<td>6400 volts</td>
</tr>
<tr>
<td>DC Grid-No.2-to-Grid-No.1 Voltage</td>
<td>800 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid-No.1 Voltage</td>
<td>90 volts</td>
</tr>
</tbody>
</table>
**GRID-MODULATED RF POWER AMPLIFIER**

**Class C Television Service**

Synchronizing-level conditions per tube unless otherwise specified

### Maximum CCC Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Synchronizing level</th>
<th>Pedestal level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7500 max. volts</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>24000 max. watts</td>
<td>4000 max. watts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE (White Level)</td>
<td>-1000 max. volts</td>
<td>12000 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>12000 max. watts</td>
<td>300 max. watts</td>
</tr>
<tr>
<td>PLATE CURRENT</td>
<td>4 max. amp</td>
<td>375 volts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>400 max. watts</td>
<td>375 volts</td>
</tr>
<tr>
<td>GRID-No.1 DISSIPATION</td>
<td>24000 max. watts</td>
<td>375 volts</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>24000 max. watts</td>
<td>375 volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>24000 max. watts</td>
<td>375 volts</td>
</tr>
</tbody>
</table>

### Typical Operation in Grid-Drive Circuit at 216 Mc:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Synchronizing level</th>
<th>Pedestal level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5800 volts</td>
<td>1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200 volts</td>
<td>5800 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-130 volts</td>
<td>-195 volts</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>375 volts</td>
<td>375 volts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>-130 volts</td>
<td>-195 volts</td>
</tr>
<tr>
<td>White level</td>
<td>-350 volts</td>
<td>-350 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>375 volts</td>
<td>375 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.45 amp</td>
<td>2.42 amp</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>3.45 amp</td>
<td>2.42 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>2.42 amp</td>
<td>2.42 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Pedestal Level)</td>
<td>0.148 amp</td>
<td>0.148 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.175 amp</td>
<td>0.175 amp</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.175 amp</td>
<td>0.175 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.095 amp</td>
<td>0.095 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>800 watts</td>
<td>425 watts</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>800 watts</td>
<td>425 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>425 watts</td>
<td>425 watts</td>
</tr>
</tbody>
</table>
**Linear RF Power Amplifier**

**Single-Sideband Suppressed-Carrier Service**

Maximum CCS* Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7500</td>
<td>max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000</td>
<td>max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td>2.8</td>
<td>max. amp</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID-No.1 CURRENT</td>
<td>0.6</td>
<td>max. amp</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT</td>
<td>20000</td>
<td>max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td>400</td>
<td>max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>12000</td>
<td>max. watts</td>
</tr>
</tbody>
</table>

**Typical CCS Class AB2 "Single-Tone" Operation at 60 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7000</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1200</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-125</td>
<td>volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>0.200</td>
<td>amp</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current</td>
<td>0</td>
<td>amp</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>1350</td>
<td>ohms</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>2.750</td>
<td>amp</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current</td>
<td>0.26</td>
<td>amp</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current</td>
<td>0.080</td>
<td>amp</td>
</tr>
<tr>
<td>Max.-Signal Peak RF Grid-No.1 Voltage</td>
<td>305</td>
<td>volts</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>25</td>
<td>watts</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>12000</td>
<td>watts</td>
</tr>
</tbody>
</table>

**Plate-Modulated RF Power Amplifier — Class C Telephony**

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS* Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>5500</td>
<td>max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000</td>
<td>max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-1000</td>
<td>max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>2</td>
<td>max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.6</td>
<td>max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>10000</td>
<td>max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>270</td>
<td>max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>8000</td>
<td>max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation in Grid-Drive Circuit:**

At 60 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>4800</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage (Modulated 100%)*</td>
<td>800</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300</td>
<td>volts</td>
</tr>
</tbody>
</table>

---

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
### RF POWER AMPLIFIER & OSCILLATOR — Class C Telephony

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>550 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.8 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.16 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.18 amp</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>125 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>6000 watts</td>
</tr>
</tbody>
</table>

### Typical Operation in Grid-Drive Circuit:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-1000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>3 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.6 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>20000 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>12000 max. watts</td>
</tr>
</tbody>
</table>

Maximum CCS* Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 220 Mc</td>
<td></td>
</tr>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-1000 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>3 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.6 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>20000 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>400 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>12000 max. watts</td>
</tr>
</tbody>
</table>

### Notes:

- Full rated filament voltage can be applied safely to the cold filament. It is not necessary to provide means for limiting the filament starting current.
- With external flat metal shield 12" square having center hole 3 5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2.
- Continuous Commercial Service.
- Computed between half-power points and based on tube output capacitance only.
- The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line-voltages, in components, in initial tube characteristics, and in tube characteristics during life.
- This value includes 700 watts of rf-circuit loss at 216 Mc.
- The driver stage is required to supply tube losses, rf-circuit losses, and rf power added to plate circuit. The driver stage should be designed as indicated in footnote (#).
- This value includes 700 watts of rf-circuit loss at 216 Mc and 1030 watts added to plate circuit.
- "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
This value includes 25 watts of rf-circuit loss.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Obtained preferably from a separate source, or from the plate supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6166A/7007 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 2000 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

Obtained preferably from a separate source, by grid-No.1 resistor, by cathode resistor, or by combination methods.

NOTE: With 5 volts ac or dc on filament.

Note 2: With external, flat, metal shield 12" square having center hole 4-5/16" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid-No.2. All other electrodes are grounded.

Note 3: Without shield and all other electrodes grounded.

Note 4: With dc plate voltage of 6000 volts, dc grid-No.2 voltage of 1200 volts, and dc plate current of 20 ma.

Note 5: With dc plate voltage of 1500 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 11 amp.
NOTE: WITH THE CYLINDRICAL SURFACES OF THE PLATE TERMINAL, GRID-N0.2 TERMINAL, GRID-N0.1 TERMINAL, AND FILAMENT TERMINALS CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G1. PROPER ENTRY OF THE TUBE IN THE GAUGE IS OBTAINED WHEN THE PLATE TERMINAL IS ENTIRELY ENGAGED BY HOLE H1 AND WILL SEAT ON THE SHOULDER BETWEEN H3 AND H2. THE PLANE SURFACE OF THIS SHOULDER IS AT RIGHT ANGLES TO THE AXES OF THE HOLES WITHIN 0° ± 2'. SEATING IS DETERMINED BY FAILURE OF A 0.020"-THICKNESS GAUGE TO ENTER MORE THAN 1/16" BETWEEN SHOULDER SURFACE AND PLATE TERMINAL. SLOTS ARE PROVIDED TO PERMIT THIS MEASUREMENT. KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.
NOTE: THE FIVE CYLINDRICAL HOLES H₁, H₂, H₃, H₄ AND H₅ HAVE AXES COINCIDENT WITHIN 0.001". THE HOLES H₆ AND H₇ HAVE AXES PARALLEL TO THE AXES OF H₁, H₂, H₃, H₄ AND H₅ WITHIN 0° ± 2'.
AVERAGE CHARACTERISTICS

$E_f = 5 \text{ VOLTS AC}$

GRID-Nº1 VOLTS = 400

GRID-Nº1 AMPERES

0 1 2 3 4 5

GRID-Nº1 VOLTS = 350

GRID-Nº1 VOLTS = 300

GRID-Nº1 VOLTS = 250

GRID-Nº1 VOLTS = 200

GRID-Nº1 VOLTS = 150

GRID-Nº1 VOLTS = 100

GRID-Nº1 VOLTS = 50

PLATE VOLTS

0 1000 2000 3000 4000 5000 6000 7000

92CS-7744R1

$E_f = 5 \text{ VOLTS AC}$

GRID-Nº2 VOLTS = 800

GRID-Nº2 AMPERES

0 1 2 3 4 5 6

GRID-Nº2 VOLTS = 400

GRID-Nº2 VOLTS = 350

GRID-Nº2 VOLTS = 300

GRID-Nº2 VOLTS = 250

GRID-Nº2 VOLTS = 200

GRID-Nº2 VOLTS = 150

GRID-Nº2 VOLTS = 100

GRID-Nº2 VOLTS = 50

PLATE VOLTS

0 1000 2000 3000 4000 5000 6000 7000

92CS-7743R1
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_0 = 5 \text{ VOLTS AC}$
$\text{GRID-N}_2 \text{ VOLTS} = 800$

GRID-N$_1$ VOLTS  400  300  200  100  0  -100  -200
GRID-N$_2$ AMPERES: IC$_2$ = 0.25, 0.5, 2.0

DATA 7
RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
10-60
AVG CHARACTERS

6166-A/7007
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_f = 5$ VOLTS AC
GRID−NO 2 VOLTS = 1200

PLATE AMPERES = 6

GRID−NO 1 VOLTS

92CM−7733RI
E_\phi = 5 \text{ VOLTS AC}
GRID-NR 2 VOLTS = 1200
AVERAGE PLATE CHARACTERISTICS
Cathode-Drive Service

$E_F = 5$ VOLTS AC
GRID-NO. 2 - TO - GRID-NO. 1 VOLTS = 890

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Electron Tube Division
Harrison, N. J.

DATA 10
1-62
AVERAGE CHARACTERISTICS
Cathode-Drive Service

E_f = 5 VOLTS AC
GRID-N2 TO GRID-N1 VOLTS = 890

GRID-N1 AMPERES

GRID-N2 AMPERES

PLATE-TO GRID N1 VOLTS

PLATE-TO GRID N2 VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service

\[ E_F = 5 \text{ VOLTS AC} \]
\[ \text{GRID-N} \# 2 \text{ TO-GRID-N} \# 1 \]
\[ \text{VOLTS} = 890 \]

PLATE AMPERES = 16

CATHODE-TO-GRID-\#1 VOLTS

92CM-7749RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 11
10-60
AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service

$E_C = 5$ Volts AC
GRID-N°2-TO-GRID-N°1
VOLTS = 890

CATHODE-TO-GRID-N°1 VOLTS

92CM-775R2

Radio Corporation of America
Electron Tube Division
Harrison, N. J.
Medium-Mu Triode

**GLASS-METAL PENCIL TYPE**

**FAST WARM-UP TIME**
**INTEGRAL PLATE RADIATOR**

For Mobile or Aircraft Applications as a RF-Power Amplifier or Oscillator Tube with Full Input up to 500 Mc and with Reduced Input up to 1700 Mc

**GENERAL DATA**

**Electrical:**

Heater, for Unipotential Cathode:

Voltage (AC or DC):
- Under transmitting conditions: 6.0 ± 10% volts
- Under standby conditions: 6.3 max. volts

Current at 6 volts: 0.280 amp

Amplification Factor: 27

Transconductance, for dc plate ma. = 27 and dc plate volts = 200: 7000 µmhos

Direct Interelectrode Capacitances:

Without External Shield: Grid to plate = 1.7 µµf, Grid to cathode = 2.8 µµf, Plate to cathode = 0.08 max.

With External Shield: Grid to plate = 1.5 µµf

**Mechanical:**

Operating Position: Any

Dimensions and Terminal Connections: See Dimensional Outline

Radiator: Integral part of tube

Terminal Connections (See Dimensional Outline):

- H - Heater
- K - Cathode
- G - Grid
- P - Plate

**Cooling:**

In many applications, the 6263A does not require forced-air cooling. The radiator in combination with a connector having adequate heat conduction capability will generally provide adequate cooling under conditions of free circulation of air. The cooling must be sufficient to limit the plate-seal temperature to 175°C. When conditions do not provide adequate circulation of air, provision should be made to direct a blast of cooling air from a small blower through the radiator fins. The quantity of air should be sufficient to limit the plate-seal temperature to 175°C. See Curves.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
**Incoming-Air Temperature**........... 40 max. °C
Plate-Seal Temperature (Measured on plate seal) ............... 175 max. °C
Weight (Approx.) .................. 24 grams (0.85 oz)
Socket for Heater Pins. Grayhill No.22-3b, Cinch No.5A16325°, or equivalent

**RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy**
Key-down conditions per tube without amplitude modulation

**Maximum Ratings, Absolute-Maximum Values:**

For altitudes up to 60,000 feet

<table>
<thead>
<tr>
<th></th>
<th>CCS°</th>
<th>ICAS°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>330 max.</td>
<td>400 max.</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100 max.</td>
<td>-100 max.</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>40 max.</td>
<td>55 max.</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>25 max.</td>
<td>25 max.</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>55 max.</td>
<td>70 max.</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>13.2 max.</td>
<td>22 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>8 max.</td>
<td>13 max.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
</tbody>
</table>

**Typical Operation as Oscillator in Cathode-Drive Circuit:**
At 500 Mc

<table>
<thead>
<tr>
<th></th>
<th>CCS°</th>
<th>ICAS°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>330</td>
<td>385</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>5h</td>
<td>7h</td>
</tr>
</tbody>
</table>

At 1700 Mc

<table>
<thead>
<tr>
<th></th>
<th>CCS°</th>
<th>ICAS°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>270</td>
<td>320</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.9h</td>
<td>1.2h</td>
</tr>
</tbody>
</table>

**Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc:**

<table>
<thead>
<tr>
<th></th>
<th>CCS°</th>
<th>ICAS°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>348</td>
<td>408</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>2.2</td>
<td>3</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>7h</td>
<td>10h</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Maximum Circuit Values:
Grid-Circuit Resistance . . . 0.1 max. 0.1 max. megohm

**PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony**

*Carrier conditions per tube for use with maximum modulation factor of 1*

**Maximum Ratings, Absolute-Maximum Values:**

*For altitudes up to 60,000 feet*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICASf</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>275 max.</td>
<td>330 max.</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100 max.</td>
<td>-100 max.</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>33 max.</td>
<td>46 max.</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>25 max.</td>
<td>25 max.</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>50 max.</td>
<td>60 max.</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>9 max.</td>
<td>15 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>5.5 max.</td>
<td>9 max.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>respect to cathode.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>respect to cathode.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical Operation in Cathode-Drive Circuit at 500 Mc:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS</th>
<th>ICASf</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>317</td>
<td>372</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>42</td>
<td>52</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>6.7h</td>
<td>8h</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values:**

Grid-Circuit Resistance . . . 0.1 max. 0.1 max. megohm

---

a A flat plate shield 1-1/4" diameter located parallel to the plane of the grid flange and midway between the grid flange and the radiator plate terminal. The shield is tied to the cathode.

b Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

c Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

d Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

e Continuous Commercial Service.

f Intermittent Commercial and Amateur Service. No Operating or "OFF" period exceeds 5 minutes and every "OFF" period is followed by an "ON" or standby period of at least the same or greater duration.

g From a grid resistor, or from a suitable combination of grid resistor and fixed supply or grid resistor and cathode resistor.

h This value of useful power is measured at load of output circuit having an efficiency of about 75 per cent.
### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.265</td>
<td>0.295</td>
<td>amp</td>
</tr>
<tr>
<td>Direct Inter electrode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td></td>
<td>1.46</td>
<td>1.95</td>
<td>μf</td>
</tr>
<tr>
<td>Grid to cathode</td>
<td></td>
<td>-</td>
<td>2.46</td>
<td>μf</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td></td>
<td>-</td>
<td>-</td>
<td>μf</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>1, 2</td>
<td>-</td>
<td>0.5</td>
<td>μm</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>1, 3</td>
<td>18</td>
<td>36</td>
<td>ma</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>1, 4</td>
<td>-</td>
<td>55</td>
<td>μa</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1, 3</td>
<td>20</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Transconductance</td>
<td>1, 3</td>
<td>5000</td>
<td>6000</td>
<td>μhos</td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>1, 5</td>
<td>-</td>
<td>100</td>
<td>μA</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>1, 6</td>
<td>-</td>
<td>100</td>
<td>μA</td>
</tr>
<tr>
<td>Emission Voltage</td>
<td>1, 7</td>
<td>-</td>
<td>10</td>
<td>volts</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From grid to plate and cathode tied together</td>
<td>1, 8</td>
<td>25</td>
<td>-</td>
<td>megohms</td>
</tr>
<tr>
<td>From plate to grid and cathode tied together</td>
<td>1, 9</td>
<td>25</td>
<td>-</td>
<td>megohms</td>
</tr>
<tr>
<td>Power Output</td>
<td>1, 10</td>
<td>6.5</td>
<td>0.5</td>
<td>watts</td>
</tr>
<tr>
<td>Change in Power Output</td>
<td>1</td>
<td>-</td>
<td>0.5</td>
<td>watt</td>
</tr>
</tbody>
</table>

**Notes:**

1. With 6.0 volts ac or dc on heater.
2. With dc plate voltage of 200 volts, dc grid voltage of -2 & volts, grid resistor of 0.5 megohm.
3. With dc plate supply voltage of 200 volts, cathode resistor of 100 ± 15 ohms, and cathode bypass capacitor of 1000 μf.
4. With dc plate voltage of 200 volts, dc grid voltage of -20 volts.
5. With 50 volts dc between heater and cathode, heater negative with respect to cathode.
6. With 50 volts dc between heater and cathode, heater positive with respect to cathode.
7. With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma.
8. With grid 100 volts negative with respect to plate and cathode which are tied together.
9. With plate 300 volts negative with respect to grid and cathode which are tied together.
10. With dc plate voltage of 350 volts, grid resistor adjusted to give a dc plate current of 50 milliamperes in a cavity-type oscillator operating at 500 ± 15 kc and having an efficiency of approximately 75 per cent.
11. At end of Power-Output test, reduce heater voltage to 5.0 volts and note change in power output.

### SPECIAL TESTS & PERFORMANCE DATA

**Low-Pressure Voltage Breakdown Test:**

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 60,000 feet. Breakdown will not occur...
when a 60 cycle rms voltage of 500 volts is applied between the plate cylinder and grid flange.

**Low-Frequency Vibration Performance:**
This test (MIL-E-1D, paragraph 4.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

- Heater voltage of 6.0 volts, dc plate supply voltage of 200 volts, grid voltage of -3 volts, and plate load resistor of 10,000 ohms.
- The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

**High-Frequency Vibration Performance:**
This test (similar to MIL-E-1D, paragraph 4.19.21) is performed on a sample lot of tubes from each production run.

- The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:
  - Heater-Cathode Leakage Current: 100 max. µA
    - For conditions shown under Characteristics Range Values Notes 1, 5 and 1, 6.
  - Low-Frequency Vibration (rms): 100 max. mV
    - For conditions shown above under Low-Frequency Vibration Performance.
  - Plate Current (2): 55 max. µA
    - For conditions shown under Characteristics Range Values Notes 1, 4.

**Shorts and Continuity Test:**
This test (MIL-E-1D, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under Characteristics Range Values, Notes 1, 2.

**Glass-Seal Fracture Test:**
This test is performed on a sample lot of tubes from each production run. Tubes are placed on supports spaced 1 1/16" ± 1/64" apart with cathode cylinder resting on one support and plate cylinder resting on the other support at a point between the radiator fins and the plate flange. Tubes will withstand gradual application, perpendicular to tube axis, of a force of 60 pounds upon the grid flange without causing fracture of the glass insulation.
Heater Cycling Life Performance:
This test (similar to MIL-E-1D, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.0 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or open circuits, and are required to meet the following limits:

Grid-Plate and Cathode Leakage Resistance. 25 min. megohms
For conditions shown under Characteristics Range Values Notes 1,8.

Heater-Cathode Leakage Current. . . . . . . . . . . . . . 150 max. 
μa
For conditions shown under Characteristics Range Values Notes 1,5.

1-Hour Stability Life Performance:
This test (similar to MIL-E-1D, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: heater voltage of 6.0 volts, plate dissipation of 2.5 to 3 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under Characteristics Range Values, Notes 1,3.

50-Hour Survival Life Performance:
This test (similar to MIL-E-1D, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for 1-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output. . . . . . . . . . . . . . . . 5 min. watts
For conditions shown under Characteristics Range Values Notes 1,10.

Plate Current (2) . . . . . . . . . . . . . . . . . . . . 100 max. μa
For conditions shown under Characteristics Range Values Notes 1,4.

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:
This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.0 volts, plate supply voltage of 400 volts, grid resistor is adjusted to give a dc plate current of 40 ma. and value is recorded, cathode resistor of 0 ohms, plate-circuit load resistance of 100 ± 5 ohms, heater positive with respect to cathode by 50 volts, and plate-
Seal temperature of 175°C min. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

Reverse Grid Current. \[ I_{\text{max.}} \mu \text{A} \]
For conditions shown under Characteristics Range Values Notes 1, 2.

Power Output. \[ 5 \text{ min. watts} \]
For conditions shown under Characteristics Range Values Notes 1, 10.

**OPERATING CONSIDERATIONS**

The heater leads of the 6263A should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.
NOTE 1: ECCENTRICITY OF RADIATOR-CORE CAP WITH RESPECT TO THE CATHODE TERMINAL IS ONE-HALF THE TOTAL RUN-OUT DETERMINED BY CHUCKING THE CATHODE TERMINAL 0.050" TO 0.100" FROM CATHODE FLANGE, ROTATING THE TUBE, AND GAUGING THE TOTAL RUN-OUT AT A POINT 0.125" FROM THE END OF THE RADIATOR-CORE CAP. THE ECCENTRICITY WILL NOT EXCEED 0.030".

NOTE 2: TILT OF PLATE-TERMINAL FIN OF RADIATOR WITH RESPECT TO ROTATIONAL AXIS OF CATHODE CYLINDER IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE PLATE-TERMINAL FIN PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM THE STRAIGHT EDGE OF THE PLATE-TERMINAL FIN FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 3: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

AVERAGE CHARACTERISTICS

$E_f = 6.0$ VOLTS
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_p = 6.0 \text{ VOLTS}$
$I_C = \text{GRID MILLIAMPERES}$
$I_B = \text{PLATE MILLIAMPERES}$
COOLING REQUIREMENTS

E.F. = 6.0 VOLTS
MAX. PLATE-SEAL TEMPERATURE = 175°C
AIR DUCT OPENING = 1-5/32" x 1-5/32"
WITH AIR DUCT LOCATED AS SHOWN ON SKETCH.

MAX. ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMP. OF 40°C
Medium-Mu Triode

GLASS-METAL PENCIL TYPE
FAST WARM-UP TIME
INTEGRAL PLATE RADIATOR
STURDY COAXIAL-ELECTRODE STRUCTURE

For Mobile or Aircraft Applications as a Frequency-Multiplier, RF-Power-Amplifier, or Oscillator Tube

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC):
Under transmitting conditions ........ 6 ± 10% volts
Under standby conditions .......... 6.3 max. volts
Current at 6 volts .................. 0.28 amp

Amplification Factor ..................... 40

Transconductance, for dc plate ma. = 18.5
and dc plate volts = 200 ............. 6800 µhos

Direct Interelectrode Capacitances:

<table>
<thead>
<tr>
<th>Without External Shield</th>
<th>With External Shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid to plate. .......... 1.75</td>
<td>1.5 µf</td>
</tr>
<tr>
<td>Grid to cathode .......... 2.95</td>
<td>- µf</td>
</tr>
<tr>
<td>Plate to cathode .......... 0.07 max.</td>
<td>- µf</td>
</tr>
</tbody>
</table>

Mechanical:

Terminal Connections (See Dimensional Outline):

- H - Heater
- K - Cathode
- G - Grid
- P - Plate

Operating Position ...................... Any
Dimensions and Terminal Connections ................ See Dimensional Outline
Radiator ................................ Integral part of tube
Cooling:

In many applications, the 6264-A does not require forced-air cooling. The radiator in combination with a connector having adequate heat conduction capability will generally provide adequate cooling under conditions of free circulation of air. The cooling must be sufficient to limit the plate-seal temperature to 175° C. When conditions do not provide adequate circulation of air, provision should be made to direct a blast of cooling air from a small blower through the radiator fins. The quantity of air should be sufficient to limit the plate-seal temperature to 175° C. See Curves.

Incoming-Air Temperature .............. 40 max. °C
<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS*</th>
<th>ICAS†</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>330 max.</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100 max.</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>40 max.</td>
<td>55 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>25 max.</td>
<td>25 max. ma</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>55 max.</td>
<td>70 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>13.2 max.</td>
<td>22 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>8 max.</td>
<td>13 max. watts</td>
</tr>
</tbody>
</table>

**Peak Heater-Cathode Voltage:**
- Heater negative with respect to cathode: 50 max. volts
- Heater positive with respect to cathode: 50 max. volts

**Typical Operation as Oscillator in Cathode-Drive Circuit:**

- **At 500 Mc:**
  - DC Plate-to-Grid Voltage: 325 volts
  - DC Cathode-to-Grid Voltage*: 25 volts
  - DC Plate Current: 35 ma
  - DC Grid Current (Approx.): 11 ma
  - Useful Power Output (Approx.): 5 watts

- **At 1700 Mc:**
  - DC Plate-to-Grid Voltage: 263 volts
  - DC Cathode-to-Grid Voltage*: 13 volts
  - DC Plate Current: 40 ma
  - DC Grid Current (Approx.): 13 ma
  - Useful Power Output (Approx.): 1 watt

**Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc:**

- DC Plate-to-Grid Voltage: 342 volts
- DC Cathode-to-Grid Voltage*: 42 volts
- DC Plate Current: 26 ma
- DC Grid Current (Approx.): 13 ma
- Driver Power Output (Approx.): 2.4 watts
- Useful Power Output (Approx.): 7.5 watts

---

**RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy**

*Key-down conditions per tube without amplitude modulation*

**Maximum Ratings, Absolute-Maximum Values:**

For Altitudes up to 60,000 ft

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS*</th>
<th>ICAS†</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>350 max.</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-100 max.</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>40 max.</td>
<td>55 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>25 max.</td>
<td>25 max. ma</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>55 max.</td>
<td>70 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>22 max. watts</td>
<td></td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>13 max. watts</td>
<td></td>
</tr>
</tbody>
</table>

---

**Radio Corporation of America**

Electron Tube Division

Harrison, N. J.
Maximum Circuit Values:
Grid-Circuit Resistance . . . 0.1 max. 0.1 max. megohm

FREQUENCY MULTIPLIER

Maximum Ratings, Absolute-Maximum Values:
For Altitudes up to 60,000 ft

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-125 max.</td>
<td>300 max.</td>
<td>350 max.</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-140 max.</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>45 max.</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>25 max.</td>
<td>ma</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>55 max.</td>
<td>ma</td>
</tr>
<tr>
<td>Plate Input</td>
<td>4.9 max.</td>
<td>watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>6 max.</td>
<td>watts</td>
</tr>
</tbody>
</table>

PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode . . . 50 max. 50 max. volts
Heater positive with respect to cathode . . . 50 max. 50 max. volts

Typical Operation as Tripler to 510 Mc in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th>DC Plate-to-Grid Voltage</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>-110</td>
<td>472</td>
<td>volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>122</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>36.5</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid Current (Approx.)</td>
<td>5.8</td>
<td>ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>4.5</td>
<td>watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>3.4</td>
<td>watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:
Grid-Circuit Resistance . . . 0.1 max. 0.1 max. megohm

A flat plate shield 1-1/8" diameter located parallel to the plane of
the grid flange and midway between the grid flange and the radiator
plate terminal. The shield is tied to the cathode.

Modulation, essentially negative, may be used if the positive peak of
the audio-frequency envelope does not exceed 115% of the carrier
conditions.

Continuous Commercial Service.
Intermittent Commercial and Amateur Service.
From a grid resistor, or from a suitable combination of grid resistor
and fixed supply or grid resistor and cathode resistor.
This value of useful power is measured at load of output circuit having
an efficiency of about 75%.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.265 0.295</td>
</tr>
<tr>
<td>Grid-to-Plate Capacitance</td>
<td>-</td>
<td>1.5 2</td>
</tr>
<tr>
<td>Grid-to-Cathode Capacitance</td>
<td>-</td>
<td>2.5 3.4</td>
</tr>
<tr>
<td>Plate-to-Cathode Capacitance</td>
<td>-</td>
<td>0.07</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>1,2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 2 10-60
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Current (1)</td>
<td>1.3</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>1.4</td>
<td>-</td>
<td>55</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.3</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Transconductance</td>
<td>1.9</td>
<td>5400</td>
<td>6200</td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>1.5</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>1.6</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>Emission Voltage</td>
<td>1.7</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From grid to plate and cathode tied together.</td>
<td>1.8</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>From plate to grid and cathode tied together.</td>
<td>1.9</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Power Output</td>
<td>1.20</td>
<td>6.5</td>
<td>-</td>
</tr>
<tr>
<td>Change in Power Output</td>
<td>11</td>
<td>-</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Note 1: With 6 volts ac or dc on heater.
Note 2: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohms.
Note 3: With dc plate supply voltage of 200 volts, cathode resistor of 100 ± 1% ohms, and cathode bypass capacitor of 1000 μF.
Note 4: With dc plate voltage of 200 volts, dc grid voltage of -12 volts, cathode resistor of 0 ohms.
Note 5: With 50 volts dc between heater and cathode, heater negative with respect to cathode.
Note 6: With 50 volts dc between heater and cathode, heater positive with respect to cathode.
Note 7: With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma.
Note 8: With grid 100 volts negative with respect to plate and cathode which are tied together.
Note 9: With plate 300 volts negative with respect to grid and cathode which are tied together.
Note 10: With dc grid voltage of 350 volts, grid resistor adjusted to give dc plate current of 50 milliamperes in a cavity-type oscillator operating at 500 Mc and having an efficiency of approximately 75 per cent.
Note 11: At end of Power-Oscillation test, reduce heater voltage to 5 volts and note change in power output.

### SPECIAL TESTS & PERFORMANCE DATA

#### Low-Pressure Voltage Breakdown Test:

This test is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 60,000 feet. Breakdown will not occur when an rms voltage of 500 volts is applied between the plate cylinder and grid flange.

#### Low-Frequency Vibration Performance:

This test (MIL-E-11, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:
Heater voltage of 6 volts, dc plate supply voltage of 200 volts, grid voltage of -2 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:
This test (similar to MIL-E-10, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater-Cathode Leakage Current . . . . . . 100 max. μA
For conditions shown under Characteristics Range Values Notes 1, 5 and 1, 6.

Low-Frequency Vibration (rms) . . . . . . 100 max. mv
For conditions shown above under Low-Frequency Vibration Performance.

Plate Current (2) . . . . . . . . . . . . . . . . . . . . . . . 55 max. μA
For conditions shown under Characteristics Range Values Notes 1, 4.

Shorts and Continuity Test:
This test (MIL-E-10, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under Characteristics Range Values, Notes 1, 2.

Heater Cycling Life Performance:
This test (similar to MIL-E-10, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or opens, and are required to meet the following limits:

Grid-Plate and Cathode Leakage Resistance . 25 min. megohms
For conditions shown under Characteristics Range Values Notes 1, 2.

Heater-Cathode Leakage Current . . . . . . 150 max. μA
For conditions shown under Characteristics Range Values Notes 1, 5.

1-Hour Stability Life Performance:
This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: heater voltage of 6 volts, plate dissipation of 2.5
to 3 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under Characteristics Range Values, Notes 1, 2.

50-Hour Survival Life Performance:

This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for 1-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Output</td>
<td>5 min. watts</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>100 max. μA</td>
</tr>
</tbody>
</table>

For conditions shown under Characteristics Range Values Notes 1, 2.

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:

This test is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6 volts, plate supply voltage of 400 volts, grid resistor is adjusted to give a dc plate current of 40 ma. and value is recorded, cathode resistor of 0 ohms, plate-circuit load resistance of 100 ± 5 ohms, heater positive with respect to cathode by 50 volts, and plate-seal temperature of 175° C min. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Grid Current</td>
<td>1 max. μA</td>
</tr>
<tr>
<td>Power Output</td>
<td>5 min. watts</td>
</tr>
</tbody>
</table>

For conditions shown under Characteristics Range Values Notes 1, 2.

OPERATING CONSIDERATIONS

The heater leads of the 6264-A should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not

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RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.

RADIATOR CORE CAP

- .290° ± .015° DIA. (NOTE 1)

AIR-COOLED RADIATOR

PLATE TERMINAL

- .290° ± .015° DIA.

GRID TERMINAL

- .812" ± .004" DIA. (NOTES 1 & 3)

CATHODE TERMINAL

- .250" ± .003" DIA.

.025" ± .002" DIA. 2 HEATER PINS

.015" ± .020" AT TERMINAL TIPS

.260" ± .030" - .060"

SEE NOTE 4

1.010" MAX. DIA.

.615" MAX. DIA.

.900" MAX.

.234" MAX.

.550" ± .025"

.075" ± .015"

.012" ± .003"

.840" ± .025"

.600" MIN.

.335" MIN.

.400" ± .050"

.400" MAX. DIA.

.553" MAX. DIA.

.400" MAX. DIA.

.335" MIN.
NOTE 1: MAXIMUM ECCENTRICITY OF CENTER LINE (AXIS) OF RADIATOR-CORE CAP OR GRID-TERMINAL FLANGE WITH RESPECT TO THE CENTER LINE (AXIS) OF THE CATHODE TERMINAL IS 0.015".

NOTE 2: TILT OF PLATE-TERMINAL FIN OF RADIATOR WITH RESPECT TO ROTATIONAL AXIS OF CATHODE CYLINDER IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE PLATE-TERMINAL FIN PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM THE STRAIGHT EDGE OF THE PLATE-TERMINAL FIN FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 3: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_f = 6$ VOLTS
$\text{IC} =$ GRID MILLIAMPERES
$\text{IB} =$ PLATE MILLIAMPERES

GRID VOLTS
50 40 30 20 10 0

PLATE VOLTS
500 400 300 200 100

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
COOLING REQUIREMENTS

E = 6 VOLTS
MAX. PLATE-SEAL TEMPERATURE = 175°C
AIR-DUCT OPENING = 1-5/32" x 1-5/32"
WITH AIR DUCT LOCATED AS SHOWN ON SKETCH.

MAX. ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMP. OF 40°C
Beam Power Tube
For Pulse-Modulator Service

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) .......................... 6.3 ± 10% volts
Current at heater volts = 6.3 ............ 1.25 amp
Transconductance, for plate volts = 200,
grid-No.2 volts = 200, and plate ma. = 100 .......................... 7000 μhos
Mu-Factor, Grid No.2 to Grid No.1 for
plate volts = 200, grid-No.2 volts =
200, and plate ma. = 100 .................... 4.5
Direct Interelectrode Capacitances:
Grid No.1 to plate .......................... 0.24 max. pf
Grid No.1 to cathode & grid No.3 &
internal shield, grid No.2, base
sleeve, and heater ....................... 13.0 pf
Plate to cathode & grid No.3 & in-
ternal shield, grid No.2, base
sleeve, and heater ................. 8.5 pf

Mechanical:
Operating Position .................................. Any
Overall Length ................................ 3-13/16" ± 1/8"
Seated Length .................................. 3-1/8" ± 1/8"
Maximum Diameter .............................. 1-23/32"
Weight (Approx.) ................................. 2.3 oz
Bulb .................................................. Small (JEDEC No.C1-1)

Bases (Alternates):
Large-Wafer Octal with Sleeve:
8-Pin Micanol (JEDEC Group 1, No.88-86)
Large-Wafer Octal with External Barriers and Sleeve:
8-Pin Micanol (JEDEC Group 1, No.88-98)
Basing Designation for BOTTOM VIEW .......... 7CK

Pin 1 - Cathode
Pin 2 - Heater
Pin 3 - Grid No.2

MODULATOR — Rectangular-Wave Modulation

Maximum and Minimum CCS^b Ratings, Absolute-Maximum Values:
For Duty Factor^c between 0.001 and 1 and maximum
averaging time of 10,000 μsec in any interval
DC PLATE SUPPLY VOLTAGE^d .......... See Rating Chart I

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RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
INSTANTANEOUS PLATE VOLTAGE: 115% of DC Plate Supply Volts
DC GRID-No.2 SUPPLY VOLTAGE: 500 max. volts
DC GRID-No.1 SUPPLY VOLTAGE: {Minimum=See Rating Chart I

GRID-No.1 VOLTAGE:
Instantaneous-negative value: 400 max. volts
Peak-positive value: 100 max. volts
PEAK PLATE CURRENT: See Rating Chart II
PEAK GRID-No.2 CURRENT: 0.75 max. amp
PEAK GRID-No.1 CURRENT: 0.5 max. amp
PLATE INPUT: 90 max. watts
GRID-No.2 INPUT: 1.75 max. watts
GRID-No.1 INPUT: 0.5 max. watt
PLATE DISSIPATION°: See Rating Chart I

PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode: 135 max. volts
Heater positive with respect to cathode: 135 max. volts

BULB TEMPERATURE (At hottest point on bulb-surface): 200 max. °F

Typical Operation:
DC Plate Supply Voltage: 3000 volts
DC Grid-No.2 Supply Voltage: 300 volts
DC Grid-No.1 Supply Voltage: -175 volts
Peak Positive Grid-No.1 Voltage: 65 volts

Plate Current:
Peak: 1.5 amp
Average: 0.015 amp
DC Grid-No.2 Current: 0.004 amp
DC Grid-No.1 Current: 0.0025 amp
Load Resistance (RL), 100 watts, non-inductive: 1500 ± 5% ohms

Maximum Circuit Values:
GRID-No.1-Circuit Resistance: 30000 max. ohms

- Without external shield and base sleeve connected to ground.
- Continuous Commercial Service.
- Duty Factor for the 6293 is defined as the "on" time in microseconds divided by 10,000 microseconds.
- "On" time is defined as the sum of the durations of all the individual pulses which occur during any 10,000-microseconds interval.

"Pulse Duration" is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

- For tube protection, it is essential that sufficient resistance be used in the plate supply circuit, the grid-No.2 supply circuit, and the grid-No.1 supply circuit so that the short-circuit current is limited to 0.5 amperes in each circuit.

- Averaged over any interval not exceeding 10,000 microseconds. Care should be used in determining the plate dissipation. A calculated value based on rectangular pulses can be considerably in error when the actual pulses have a finite rise and fall time. Plate dissipation should preferably be determined by measuring the bulb temperature under actual operating conditions; then, with the tube in the same socket and under the same ambient-temperature conditions, apply to the tube sufficient dc input to obtain the same bulb temperature. This value of dc input is a measure of the plate dissipation. ° Indicates a change.
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>1.175</td>
<td>1.325</td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.24</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; grid No.3, and internal shield, grid No.2, base sleeve, and heater</td>
<td>2</td>
<td>12.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Plate to cathode &amp; grid No.3, internal shield, grid No.2, base sleeve, and heater</td>
<td>2</td>
<td>7.3</td>
<td>9.5</td>
</tr>
<tr>
<td>Plate Current</td>
<td>3</td>
<td>46</td>
<td>94</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>3</td>
<td>0</td>
<td>5.5</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>1,4</td>
<td>2.4</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac on heater.
Note 2: With no external shield. Base sleeve (pin No. 8) is grounded.
Note 3: With 6.3 volts ac on heater, dc plate voltage of 300 volts, dc grid-No.2 voltage of 200 volts, and dc grid-No.1 voltage of -33 volts.

OPERATING CONSIDERATIONS

Plate shows no color when tube is operated at maximum GCS ratings.

ALL DIMENSIONS IN INCHES.
TEST CIRCUIT

C1: 0.1 µf, 600 v dc
C2: 2 µf, 600 v dc
C3: 0.25 µf, 5000 v dc
Ecc1: Grid-No.1 Supply Volt.
Ecc2: Grid-No.2 Supply Volt.
Ebb: Plate Supply Voltage
Eg1: Rectangular-Wave
Signal Voltage
R1: 20 ohms, 1 watt, non-inductive
R2: 3000 ohms, 1 watt
R3: 10 ohms, 5 watts, non-inductive
R4: 25 ohms, 1 watt, non-inductive
R5: 1000 ohms, 1 watt
R6: 10000 ohms, 50 watts
R7: 30 ± 1% ohms, non-inductive
Rl: For values, see Typical Operation and Characteristics Range Values (Note 4)
RATING CHART I

Eo = 6.3 VOLTS
AVERAGING TIME = 10000 MICROSECONDS MAX.
RATING CHART II

- $E_F = 6.3$ VOLTS
- AVERAGING TIME = 10000 MICROSECONDS MAX.

MAX. PEAK PLATE AMPERES

DUTY FACTOR

JUN. 6, 1953
TUBE DEPARTMENT

BROADCAST CORPORATION OF AMERICA, MARRIOT, NEW JERSEY

92CM - 8014
6293
BEAM POWER AMPLIFIER

AVERAGE PLATE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-N2 SUPPLY VOLTS = 200
SERIES GRID-N2 RESISTOR (OHMS) = 1000

AVERAGE PLATE CHARACTERISTICS

E_f = 6.3 VOLTS
GRID-N2 SUPPLY VOLTS = 300
SERIES GRID-N2 RESISTOR (OHMS) = 1000

OCT. 1, 1953
TUBE DEPARTMENT
EMERSON CORPORATION OF AMERICA, HARRISON, NEW JERSEY
BEAM POWER AMPLIFIER

AVERAGE PLATE CHARACTERISTICS

\[ E_p = 6.3 \text{ VOLTS} \]
GRID-N\#2 SUPPLY VOLTS = 400
SERIES GRID-N\#2 RESISTOR (OHMS) = 1000

- Plate Current vs Plate Voltage
- Grid-N\#1 Supply Volts (EC1) x +50
- Grid-N\#1 Voltage vs Plate Voltage

OCT. 1, 1953
TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY.

CE-8018T
-8019T
## Heater, for Unipotential Cathode:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>12.6 ± 10% ac or dc volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>0.375</td>
</tr>
</tbody>
</table>

Except for heater rating, the 6417 is the same as the 5763.

With 12.6 volts on heater of the 6417, the minimum heater current is 0.345 ampere and the maximum heater current is 0.405 ampere.
UHF BEAM POWER TUBE
WATER-COOLED ELECTRODES

GENERAL DATA

Electrical:
Filament*, 2-Section Multi-strand Thoriated Tungsten:
Voltage per section (AC or DC) .... 1.35 av. volts
Current per section at 1.35 volts .... 1000 amp
Starting current per section .... 1500 amperes
Cold resistance per section .... 0.0002 ohm
Minimum heating time .... 10 seconds
Supply circuits .... See Circuits

Mu-Factor, Grid No.2 to Grid No.1 for plate voltages 3000, grid No.2 volts 800, and plate amperes 4. .... 6

Direct Interelectrode Capacitances:
Grid No.1 to plate .... 0.1 max. μf
Input .... 335 μf
Output .... 30 μf

Internal Bypass Capacitors between Grid No.2 and Cathode (Total) .... 15000 μf

Mechanical:

Terminal Connections:
F1 - Fil. Sect. No.1 & Water Conn.
F2 - Fil. Sect. No.2 & Water Conn.
G1 - RF Grid-No.1 Term. Contact Surface
G1w - DC Grid-No.1 & Water Conn.
G2 - DC Grid-No.2 & Water Conn.
Kp - RF Cath. Term. Contact Surface
Fm - Common Point of Fil. Sections & Water Conn.
P - RF Plate Term. Contact Surface

Mounting Position .... Tube axis vertical, with plate terminal either up or down
Overall Length .... 7-11/32" +3/8" -1/2"
Maximum Diameter .... 11-3/8"

Air Cooling:
Forced-air cooling of the ceramic bushing at the grid-No.1 seal and at the plate seal is required only if the temperature of the ceramic bushing at either seal exceeds the specified maximum value of 150°C. Under such conditions, provision should be made for blowing air at the ceramic bushings through suitable openings in the coaxial-cylinder cavity circuit.

*: See Operating notes on conserving filament life.

MAY 3, 1954
Water Cooling:
Water cooling of the filament-section blocks, rf cathode terminals, grid-No.1 block, grid-No.2 block, and plate is required. The water flow must start before application of any voltage and preferably should continue for several seconds after removal of all voltages. Interlocking of the water flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow.

Water Flow:

<table>
<thead>
<tr>
<th>To</th>
<th>Min gpm</th>
<th>Typical gpm</th>
<th>Pressure Drop psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Filament-Section-No.1 Block</td>
<td>0.5</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>To Filament-Section-No.2 Block</td>
<td>0.5</td>
<td>1.2</td>
<td>11</td>
</tr>
<tr>
<td>To Filament Mid-Tap Block</td>
<td>0.5</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>To Grid-No.1 Block</td>
<td>0.5</td>
<td>1.2</td>
<td>10</td>
</tr>
<tr>
<td>To Grid-No.2 Block</td>
<td>0.5</td>
<td>0.5</td>
<td>6</td>
</tr>
<tr>
<td>To Plate:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For plate dissipation of 10 kw</td>
<td>4.5</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>For plate dissipation of 15 kw</td>
<td>7.5</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>For plate dissipation of 20 kw</td>
<td>11</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>For plate dissipation of 26 kw</td>
<td>14</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

Gauge Pressure at Any Inlet: 70 max. psi
Ceramic Bushing Temperature: 150 max. °C
Outlet Water Temperature (Any outlet): 70 max. °C
Weight (Approx.): 25 lbs

RF POWER AMPLIFIER--Class B Television Service
Synchronizing-level conditions per tube unless otherwise indicated

Maximum CCS* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th></th>
<th>Up to 1000 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7000 max. volts</td>
</tr>
<tr>
<td>DC PLATE-SUPPLY VOLTAGE</td>
<td>8000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2-SUPPLY VOLTAGE</td>
<td>1100 max. volts</td>
</tr>
</tbody>
</table>

* Directly across cooled element for the indicated flow.

*: See next page.
UHF BEAM POWER TUBE

DC PLATE CURRENT 7 max. amp
DC GRID-No.1 (CONTROL-GRID) CURRENT 0.5 max. amp
PLATE INPUT 49000 max. watts
GRID-No.2 INPUT (Pedestal Level) 600 max. watts
PLATE DISSIPATION 26000 max. watts.

Typical Operation:

<table>
<thead>
<tr>
<th>Bandwidth of</th>
<th>At 500 Mc</th>
<th>At 900 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6000</td>
<td>6500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>950</td>
<td>950</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-140</td>
<td>-140</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>6.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>5.3</td>
<td>5.2</td>
</tr>
<tr>
<td>DC Grid-No.2 Current:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.75</td>
<td>0.6</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.35</td>
<td>0.3</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.13</td>
<td>0.1</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Driver Power Output (Approx.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>600</td>
<td>1000</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>350</td>
<td>560</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>15000**</td>
<td>12000**</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>8400**</td>
<td>6700**</td>
</tr>
</tbody>
</table>

PLATE-MODULATED RF POWER AMP.—Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum CGS* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Up to 1000 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
</tr>
<tr>
<td>PEAK GRID-No.2 VOLTAGE (DC + AC Component)</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
</tr>
<tr>
<td>PLATE INPUT</td>
</tr>
</tbody>
</table>

* Between the half-power points as measured in the output circuit.

MAY 3, 1954
## UHF Beam Power Tube

**GRID-No.2 INPUT** | 400 max. volts  
**PLATE DISSIPATION** | 16500 max. watts

### Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>At 400 Mc</th>
<th>At 900 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>4000</td>
<td>4250</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-200</td>
<td>-200</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>4.25</td>
<td>4</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.65</td>
<td>0.6</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>700</td>
<td>1000</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>80</td>
<td>75</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>7250**</td>
<td>4500**</td>
</tr>
</tbody>
</table>

### RF Power Amplifier—Class C Telegraphy and FM Telephony

**Maximum CCS° Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 1000 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>7000 max. volts</td>
</tr>
<tr>
<td>DC PLATE-SUPPLY VOLTAGE</td>
<td>8000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2-SUPPLY VOLTAGE</td>
<td>1100 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>6.5 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.5 max. amp</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>45500 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>600 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>26000 max. watts</td>
</tr>
</tbody>
</table>

### Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>At 400 Mc</th>
<th>At 900 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6500</td>
<td>6500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-140</td>
<td>-140</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>6</td>
<td>6.3</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>0.2</td>
<td>0.15</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>400</td>
<td>800</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>85</td>
<td>77</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>14000**</td>
<td>11000**</td>
</tr>
</tbody>
</table>

* Continuous Commercial Service.

† Obtained preferably from a separate source.

**See next page.**

MAY 3, 1954

TENTATIVE DATA 2

TELEVISION DIVISION

BROADCAST CORPORATION OF AMERICA, HARRISON, NEW JERSEY
**UHF BEAM POWER TUBE**

- **Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.**

- The driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

- This value of useful power is measured at load of output circuit having indicated efficiency.

- Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should not be used if the 6448 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No.2 voltage from rising above 1100 volts under key-up conditions; and additional fixed grid-No.1 bias must be provided to limit the plate current.

- Obtained from fixed supply, by grid-No.1 resistor, by cathode resis-

- tor, or by combination methods.

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current per Section 1</td>
<td>1</td>
<td>900</td>
</tr>
<tr>
<td>Filament Current per Section 2</td>
<td>2</td>
<td>960</td>
</tr>
<tr>
<td>Grid-No.1 Voltage</td>
<td>1,3</td>
<td>–</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>1,4</td>
<td>11000</td>
</tr>
<tr>
<td>Power Gain</td>
<td>1,4,5</td>
<td>10</td>
</tr>
</tbody>
</table>

Note 1: With 1.35 volts ac per section.
Note 2: With 1.5 volts ac per section.
Note 3: With 2-phase excitation of the filament sections, dc plate voltage of 6500 volts, dc grid-No.2 voltage of 800 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.5 ampere.
Note 4: With 2-phase excitation of the filament sections. In rf power amplifier circuit having bandwidth of 7 Mc as defined by the half-power points and with dc plate voltage of 7000 volts, dc grid-No.2 voltage of 800 volts, dc grid-No.1 voltage of +130 volts, drive adjusted to give dc plate current of 6.75 amperes, and frequency of 900 Mc.
Note 5: With driving power measured at input to input-cavity circuit fed by transmission line having voltage-standing-wave ratio not greater than 2. Power gain is ratio of useful power output to driving power.

### OPERATING NOTES

- Instructions for conserving filament life of the 6448 and for the use of high-speed electronic protective devices with it are given in the technical bulletin. A copy of the technical bulletin for the 6448 will be supplied on request to Commercial Engineering, RCA, Harrison, N.J.
FILAMENT-SUPPLY CIRCUITS

WITH SINGLE-PHASE AC EXCITATION

SECTIONS IN SERIES

INPUT END

$V = 2.7 \text{ VOLTS RMS} \quad A = 1000 \text{ AMPERES}$

SECTIONS IN PARALLEL

INPUT END

$V = 1.35 \text{ VOLTS RMS} \quad A = 2000 \text{ AMPERES}$

WITH TWO-PHASE (QUARTER PHASE) AC EXCITATION

INPUT END

Center Tap For Circuit Returns

$V = 1.35 \text{ VOLTS RMS} \quad A = 1000 \text{ AMPERES}$

WITH DC EXCITATION

SECTIONS IN SERIES

INPUT END

$V = 2.7 \text{ VOLTS DC} \quad A = 1000 \text{ AMPERES}$

SECTIONS IN PARALLEL

INPUT END

$V = 1.35 \text{ VOLTS DC} \quad A = 2000 \text{ AMPERES}$

$F_1 = \text{FILAMENT SECTION N°1}$

$F_2 = \text{FILAMENT SECTION N°2}$

$F_m = \text{COMMON POINT OF FILAMENT SECTIONS}$

MAY 3, 1954

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8429
NOTE 1: WATER CONNECTIONS FOR FILAMENT SECTIONS NO.1 AND NO.2, COMMON POINT OF FILAMENT SECTIONS, GRID NO.1, AND GRID NO.2 HAVE 1" -16 AMERICAN STANDARD THREAD, FREE FIT (CLASS 2), 3/8" LONG, AND 2 HOLES 0.257" - 0.270" DIAMETER SPACED 7/16" ON CENTERS.


NOTE 3: WATER CONNECTION FOR THE PLATE HAS 1-3/4" -16 AMERICAN STANDARD THREAD, FREE FIT (CLASS 2), 3/8" LONG, AND 2 HOLES 0.508" - 0.522" DIAMETER SPACED 11/16" ON CENTERS.


NOTE 5: CONTACT LENGTH OF CIRCUIT CONNECTOR IS 5/16" MAX.

NOTE 6: THIS DIAMETER DIMENSION IS HELD ONLY OVER A LENGTH OF 5/16"; OVER REMAINDER OF LENGTH, THE DIAMETER MAY INCREASE TO 3-7/8" MAX.

NOTE 7: THE AXIS OF THE RF PLATE CONTACT SURFACE IS COINCIDENT WITH THE AXIS OF THE RF GRID-NO.1 CONTACT SURFACE WITHIN 3/32".

NOTE 8: THE CONTACT SURFACES 8A-8A' AND 8B-8B' ARE PARALLEL WITHIN 1/16".

NOTE 9: SERIAL NUMBER IS LOCATED ON THIS SURFACE BETWEEN DC GRID-NO.2 AND FILAMENT SECTION NO.1 CONNECTIONS.
NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".
NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".
NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001".
AVERAGE CHARACTERISTICS

$E_f = 1.35$ VOLTS AC

GRID-N2 VOLTS = 800

$E_{C1} = +60$

$E_{C1} = +40$

$E_{C1} = +20$

$E_{C1} = +10$

$E_{C1} = +5$

GRID-N2 (I_{C1}) OR GRID-N2 (I_{C2}) AMPERES

PLATE VOLTS

FEB 17 1944

TUBE DIVISION

RCA CORPORATION OF AMERICA, HARRISON, N.J.

92CM-6448
AVERAGE CHARACTERISTICS

$E_F = 1.35\text{ VOLTS AC}$

GRID-$\text{N}\text{° 2 VOLTS}=1000$

GRID-$\text{N}\text{° 1}$ OR GRID-$\text{N}\text{° 2}$ ($I_C$) AMPERES

PLATE VOLTS

FEB.16,1954
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

92CM-8246
MAGNETRON
FORCED-AIR COOLED

**Fixed Frequency:** 5400 ± 20 Mc

---

### GENERAL DATA

#### Electrical:

- **Heater, for Unipotential Cathode:**
  - Voltage: 10 ± 10% ac or dc volts
  - Current: 3.2 amp
- **Starting current:** The maximum instantaneous starting current must never exceed 12 amperes, even momentarily.
- **Minimum Cathode Heating Time:** 5 minutes
- **Frequency:**
  - Maximum Frequency Pulling at VSWR of 1.5/1: 10 Mc
  - Maximum Frequency Change with Anode Temperature Change (After warmup): 0.15 Mc/°C

#### Mechanical:

- **Dimensions and Terminal Connections:**
  - See Dimensional Outline
  - Connector (For heater terminal and heater-cathode terminal): Ucinite® No. 115364 with built-in capacitor, or equivalent
- **Mounting Position:** Any
- **Air Flow:**
  - For fins—An air stream should be directed along the cooling fins toward the body of the tube. The stream may be obtained from a rectangular nozzle about 3" x 1-1/2" located so that the plane through the 3" side is parallel with the plane of a cooling fin and so that the nozzle is centered on the body of the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150°C.
  - For Heater-Cathode terminal—Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165°C.

#### Weight (Approx.)

11-1/2 lbs

---

### PULSED OSCILLATOR SERVICE

**Maximum and Minimum Ratings, Absolute Values:**

For Duty Cycle of 0.001 max.

- **PEAK ANODE VOLTAGE**: 16 max. kv
- **PEAK ANODE CURRENT**: 16 max. amp
- **PEAK POWER INPUT**: 256 max. kw

---

* Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newtonville 60, Massachusetts.

* For atmospheric pressures greater than 40 centimeters of mercury at 25°C, operation at pressures lower than 40 centimeters of mercury (altitudes higher than 16,000 feet) may result in arcover with consequent damage to the tube.

---

MAY 1, 1955

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

TENTATIVE DATA 1
### Magnetron Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Power Input</td>
<td>0.256 max. kw</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>2.2 max. µsec</td>
</tr>
<tr>
<td>Operation Time in Any 100-Microsecond Interval</td>
<td>5 max. µsec</td>
</tr>
<tr>
<td>Rate of Rise of Voltage Pulse</td>
<td>120 max. kv/µsec</td>
</tr>
<tr>
<td>Anode Block Temperature</td>
<td>150 max. °C</td>
</tr>
<tr>
<td>Heater-Cathode Terminal Temperature</td>
<td>165 max. °C</td>
</tr>
<tr>
<td>Load Voltage Standing-Wave Ratio</td>
<td>1.5 max.</td>
</tr>
</tbody>
</table>

**Typical Operation**

With Load Voltage Standing-Wave Ratio Equal To or Less Than 1.05

With Duty Cycle of 0.0008

Heater Voltage: See Operating Considerations

Magnetic Field: Supplied by permanent magnet integral with tube

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Anode Voltage (Approx.)</td>
<td>15 kv</td>
</tr>
<tr>
<td>Peak Anode Current</td>
<td>13.5 amp</td>
</tr>
<tr>
<td>Pulse Repetition Rate</td>
<td>400 cps</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>2 µsec</td>
</tr>
<tr>
<td>Maximum RF Bandwidth</td>
<td>1.5 Mc</td>
</tr>
<tr>
<td>Peak Power Output</td>
<td>85 kw</td>
</tr>
</tbody>
</table>

**Operating Considerations**

- Waveguide output flange is designed for use with a standard 1" x 2" rectangular waveguide such as that designated by RETMA as WR 187, or that having the JAN designation RG-49/U, and mates with flanges such as Airtron® No.954626 or equivalent.

- It is essential that the input circuit be designed so that if arcing occurs the energy per pulse delivered to the tube cannot greatly exceed the normal energy per pulse. To satisfy this requirement, it is recommended that pulser's of the discharging-network type be used.

- Manufactured by Airtron, Inc., Linden, N. J.

---

**Note:**

1. With 10.0 volts ac on heater.
2. With peak anode current of 13.5 amperes, and heater voltage reduced to 9.1 volts.
3. With peak anode voltage of approximately 15 kilovolts, anode block temperature of approximately 100°C, and maximum VSWR equal to or less than 1.05.
4. Pulses are considered to be missing if the energy level at the operating frequency is less than 70 per cent of the normal value at a VSWR of 1.5, and with VSWR phase adjusted to produce maximum instability.
As soon as the 6521 begins to oscillate, the heater voltage should be reduced to 9.1 volts when it is operated under the typical operating conditions shown in the tabulated data. For other operating conditions, the heater voltage ($E_h$) should be reduced depending on the average power input ($P_i$) to the tube as follows:

<table>
<thead>
<tr>
<th>$P_i$ (watts)</th>
<th>$E_h$ (volts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 90</td>
<td>10.0</td>
</tr>
<tr>
<td>90 to 130</td>
<td>9.9</td>
</tr>
<tr>
<td>130 to 180</td>
<td>9.5</td>
</tr>
<tr>
<td>180 to 220</td>
<td>9.1</td>
</tr>
<tr>
<td>220 to 256</td>
<td>8.9</td>
</tr>
</tbody>
</table>

MAY 1, 1955
MAGNETRON

4 MOUNTING BOSSES
1/4-20 THREAD
3/8 MIN. DEPTH
(NOTE 10)

AXIS OF
HEATER-CATHODE
TERMINAL

281/4 ±0.005" DIA.
4 HOLES

3.000 ±.010

1 1/2
(NOTE 1)

3/32 ± 3/64
(NOTE 3)

1 1/8
(NOTE 1)

2.500 ±.010

1/4 ± 3/64

FLANGE FOR
ALTERNATE
MOUNTING
(NOTES 2 & 10)

SEE DETAIL A

WAVEGUIDE
OUTPUT FLANGE
(NOTES 4 & 10)

COOLING FIN

C OF WAVEGUIDE
OUTPUT FLANGE

REFERENCE
PLANE II

SEE DETAIL B

REFERENCE
PLANE III

5 ± 1/16
(NOTE 3)

7 1/8 MAX.

SEE DETAIL A

NOTE 5

REFERENCE
PLANE I

2 11/16
MAX

2 5/64
± 3/64

4 17/32
MAX

1 ± 3/32

2 1/32

92CL-8537

MAY 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
Reference plane I is defined as that plane against which the waveguide output flange abuts.

Reference plane II is defined as that plane perpendicular to reference plane I and touching the surface of the flange for alternate mounting.

Reference plane III is defined as that plane perpendicular to reference plane I and passing through the exact centers of holes 'A' and 'B'.
MAGNETRON

NOTE 1: The axis of the heater-cathode terminal will be within the confines of a cylinder whose radius is 3/64" and whose axis is perpendicular to reference plane II at the specified location.

NOTE 2: When resting on a smooth surface, this flange surface shall have a flatness such that a 0.050" thickness gauge 1/8" wide shall not enter between the two surfaces, and it shall be perpendicular to reference plane I within ±2°.

NOTE 3: The tolerances include angular as well as lateral deviations.

NOTE 4: With the waveguide output flange resting on a plane surface, a 0.005" thickness gauge 1/8" wide shall not enter between the two surfaces.

NOTE 5: No part of the tube support fastened to the flange for alternate mounting should extend within the surface of a cylinder whose radius is 3/4" and whose axis is perpendicular to reference plane II at the specified location.

NOTE 6: These dimensions define extremities of the 0.169" internal diameter of the cylindrical heater terminal.

NOTE 7: These dimensions define extremities of the 0.540" internal diameter of the cylindrical heater-cathode terminal.

NOTE 8: No part of the connector device for the heater and heater-cathode terminals should bear against the underside of this lip.

NOTE 9: The heater terminal and heater-cathode terminal are concentric within 0.010".

NOTE 10: Connection to the anode may be made through the mounting bosses, the flange for alternate mounting, or the waveguide output flange.
ANODE VOLTS (APPROX.) = 15000
PEAK ANODE AMPERES = 13.5
PULSE DURATION: 2 MICROSECONDS
PULSE REPLICATION RATE: 400 PPS
CATHODE WARMUP TIME: 5 MINUTES
OPERATING FREQUENCY: 5400 ± 20 Mc
PULSE DURATION: 2 MICROSECONDS
PULSE REPETITION RATE: 400 PPS
TUBE OPERATING INTO MATCHED LOAD

PEAK ANODE AMPERES

PEAK ANODE VOLTAGE

TUBE EFFICIENCY

PEAK POWER OUTPUT - KWATTS

FEB. 8, 1955
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
TWIN BEAM POWER TUBE

Useful at frequencies up to 470 Mc

Unless Otherwise Specified, Values are on a Per-Tube Basis

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
  Voltage .................. 6.3 ± 10% ................ ac or dc volts
  Current .................. 1.25 .......................... amp
  Transconductance¹ for dc plate volts = 200,
  dc grid-No.2 volts = 200, and dc plate ma = 60 4500 μhos
  Mu-Factor, Grid No.2 to Grid No.1²
  for dc plate volts = 200, dc grid-No.2
  volts = 200, and dc plate ma = 50 ................ 8.5

Direct Interelectrode Capacitances:³
  Grid No.1 to plate .......... 0.11 max. μuf
  Grid No.1 to cathode & grid No. 3 &
  internal shield, grid No.2 (pins 1 & 7), and heater .......... 7 μuf
  Plate to cathode & grid No.3 & in-
  ternal shield, grid No.2 (pins 1 & 7), and heater .......... 3.4 μuf

Mechanical:
  Mounting Position .............. Any
  Maximum Overall Length .......... 3-9/16"
  Seated Length ................ 3" ± 1/8"
  Maximum Diameter ............. 1-11/16"
  Bulb .......................... See Dimensional Outline
  Bulb Terminals (Two) ........ See Dimensional Outline
  Weight (Approx.) ............. 3 oz
  Base ......................... Medium-Button Septar 7-Pin (JETEC No.E7-20)

  Pin 1—Grid No.2
  Pin 2—Grid No.1 of
  Unit No.2
  Pin 3—Heater
  Pin 4—Cathode,
  Grid No.3,
  Internal Shield
  Pin 5—Heater
  Pin 6—Grid No.1 of
  Unit No.1
  Pin 7—Grid No.2

  Pin 1—Plate of
  Unit No.1
  Pin 2—Plate of
  Unit No.2

PLANE OF ELECTRODES OF EACH UNIT IS
PARALLEL TO PLANE THROUGH AXIS OF
TUBE AND AA

Bulb Temperature (At hottest point) .......... 210 max. °C
Cooling: Free circulation of air around the tube is required. In addi-
tion, some forced-air cooling will generally be required to pre-
vent exceeding the specified maximum bulb temperature.

¹ Each unit.
² with no external shield.

6-56 TUBE DIVISION
DATA 1
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
**TWIN BEAM POWER TUBE**

**AF POWER AMPLIFIER & MODULATOR — Class AB₂⁺**

<table>
<thead>
<tr>
<th>Maximum Ratings, Absolute Values:</th>
<th>CCS⁰</th>
<th>ICAS²⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>500 max.</td>
<td>600 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
<td>300 max.</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 SUPPLY VOLTAGE</td>
<td>400 max.</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT**</td>
<td>150 max.</td>
<td>150 max. ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT**</td>
<td>70 max.</td>
<td>85 max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT**</td>
<td>3 max.</td>
<td>3 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION**</td>
<td>20 max.</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Heater negative with respect</td>
<td>135 max.</td>
<td>135 max. volts</td>
</tr>
<tr>
<td>to cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Heater positive with respect</td>
<td>135 max.</td>
<td>135 max. volts</td>
</tr>
<tr>
<td>to cathode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typical CCS Operation:**

| DC Plate Voltage                  | 400 | 500 volts |
| DC Grid-No.2 Voltage              | 200 | 200 volts |
| DC Grid-No.1 (Control-Grid) Voltage: |     |         |
| From fixed-bias source            | -23 | -26 volts |
| Peak AF Grid-No.1-to-Grid-No.1 Voltage | 72 | 70 volts |
| DC Plate Current:                 |     |         |
| Zero-signal value                 | 25  | 20 ma    |
| Max.-signal value                 | 145 | 116 ma   |
| DC Grid-No.2 Current:             |     |         |
| Zero-signal value                 | 0.1 | 0.1 ma   |
| Max.-signal value                 | 10  | 10 ma    |
| DC Grid-No.1 Current:             |     |         |
| Max.-signal value                 | 2.4 | 2.6 ma   |
| Effective Load Resistance (Plate to plate) | 7100 | 11100 ohms |
| Max.-Signal Driving Power (Approx.) | 0.1 | 0.1 watt |
| Max.-Signal Power Output (Approx.) | 39  | 40 watts |

**Typical ICAS Operation:**

| DC Plate Voltage                  | 500 | 600 volts |
| DC Grid-No.2 Voltage              | 200 | 200 volts |
| DC Grid-No.1 (Control-Grid) Voltage: |     |         |
| From fixed-bias source            | -25 | -26 volts |

† Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.
Averaged over any audio-frequency cycle of sine-wave form.

See next page.
TWIN BEAM POWER TUBE

Typical ICAS Operation (Cont'd):
Peak AF Grid-No.1-to-Grid-No.1 Voltage ........ 76 volts
DC Plate Current:
Zero-signal value ................................ 25 ma
Max.-Signal value ................................ 145 ma
DC Grid-No.2 Current:
Zero-signal value ................................ 0.1 ma
Max.-Signal value ................................ 10 ma
DC Grid-No.1 Current:
Max.-Signal value ................................ 2.9 ma
Effective Load Resistance
(Plate to plate) .................................. 8900 ohms
Max.-Signal Driving Power
(Approx.) ........................................ 0.1 watt
Max.-Signal Power Output
(Approx.) ........................................ 50 watts

Maximum Circuit Values (CCS or ICAS):
Grid-No.1-Circuit Resistance:
With fixed bias ................................... 30000 max. ohms
With cathode bias ................................ Not recommended

PLATE-MODULATED PUSH-PULL RF POWER AMP. — Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0

Maximum Ratings, Absolute Values:
For max. plate voltage and max. plate input above 100 Me, see Rating Chart I
DC PLATE VOLTAGE ............................... 400 max. 500 max. volts
DC GRID-No.2 (SCREEN) VOLTAGE ........ 300 max. 300 max. volts
DC GRID-No.2 SUPPLY VOLTAGE ............ 400 max. 400 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE -200 max. -200 max. volts
DC PLATE CURRENT ............................... 125 max. 125 max. ma
DC GRID-No.1 CURRENT ......................... 4 max. 4 max. ma
PLATE INPUT .................................... 45 max. 55 max. watts
GRID-No.2 INPUT ................................ 2 max. 2 max. watts
PLATE DISSIPATION ............................... 13.5 max. 16.7 max. watts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode ........ 135 max. 135 max. volts
Heater positive with respect to cathode ........ 135 max. 135 max. volts

Preferably obtained from a separate source or from the plate-voltage supply with a voltage divider.

Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB2 stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 30000 ohms.

See next page.

AUG. 16, 1954
TWIN BEAM POWER TUBE

Typical Operation up to 100 Mc:

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 volts</td>
<td>200 volts</td>
</tr>
</tbody>
</table>

From an adjustable series resistor having max. value of 45000 ohms

<table>
<thead>
<tr>
<th>DC Grid-No.1 Voltage</th>
<th>DC Grid-No.2 Current (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-61 volts</td>
<td>7 ma</td>
</tr>
</tbody>
</table>

From combination employing

<table>
<thead>
<tr>
<th>DC Plate Current</th>
<th>DC Grid-No.1 Current (Approx.)</th>
<th>Driving Power</th>
<th>Power Output (Approx.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 ma</td>
<td>2.5 ma</td>
<td>0.2 watt</td>
<td>31 watts</td>
</tr>
</tbody>
</table>

Typical Operation at 462 Mc:

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 volts</td>
<td>200 volts</td>
</tr>
</tbody>
</table>

From an adjustable series resistor having max. value of 45000 ohms

<table>
<thead>
<tr>
<th>DC Grid-No.1 Voltage</th>
<th>DC Grid-No.2 Current (Approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60 volts</td>
<td>7 ma</td>
</tr>
</tbody>
</table>

From combination employing

<table>
<thead>
<tr>
<th>DC Plate Current</th>
<th>DC Grid-No.1 Current (Approx.)</th>
<th>Driving Power</th>
<th>Useful Power Output(Approx.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 ma</td>
<td>1 ma</td>
<td>0.2 watt</td>
<td>9 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

| Grid-No.1-Circuit Resistance | 30000 max. 30000 max. ohms |

PUSH-PULL RF POWER AMP. & OSCILLATOR--Class C Telegraphy

and

PUSH-PULL RF POWER AMPLIFIER--Class CFM Telephony

Maximum Ratings, Absolute Values:

For max. plate voltage and max. plate input above 100 Mc, see Rating Chart II

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>DC GRID-No.2 (SCREEN) VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 max.</td>
<td>300 max.</td>
</tr>
</tbody>
</table>

* Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

* Obtained from a combination of grid-no.1 resistor with either fixed supply or cathode resistor. The combination of grid-no.1 resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

0 00 0 0 0 0 0 0: See next page.

TENTATIVE DATA 2

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

AUG. 16, 1954
### TWIN BEAM POWER TUBE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>CCS°</th>
<th>ICAS°</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID- No. 2 SUPPLY VOLTAGE</td>
<td>400 max.</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID- No. 1 (CONTROL-GRID) VOLTAGE</td>
<td>-200 max.</td>
<td>-200 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>150 max.</td>
<td>150 max. ma</td>
</tr>
<tr>
<td>DC GRID- No. 1 CURRENT</td>
<td>4 max.</td>
<td>4 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>70 max.</td>
<td>85 max. watts</td>
</tr>
<tr>
<td>GRID- No. 2 INPUT</td>
<td>3 max.</td>
<td>3 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max.</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>135 max.</td>
<td>135 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>135 max.</td>
<td>135 max. volts</td>
</tr>
</tbody>
</table>

**Typical Operation up to 100 Mc:**

| DC Plate Voltage                      | 500 | 600 volts |
| DC Grid-No. 2 Voltage (Approx.)       | 200 | 200 volts |
| From an adjustable series resistor having max. value of | 40000 ohms | 40000 ohms |
| DC Grid-No. 1 Voltage                 | -44 | -44 volts |
| From grid resistor of                 | 12000 ohms | 12000 ohms |
| From cathode resistor of              | 330 | 330 ohms |
| DC Plate Current                      | 120 | 120 ma |
| DC Grid-No. 2 Current (Approx.)       | 8 | 8 ma |
| DC Grid-No. 1 Current (Approx.)       | 3.7 | 3.7 ma |
| Driving Power (Approx.)               | 0.2 | 0.2 watt |
| Power Output (Approx.)                | 46 | 56 watts |

**Typical Operation as Amplifier at 482 Mc:**

| DC Plate Voltage                      | 300 | 300 volts |
| DC Grid-No. 2 Voltage (Approx.)       | 200 | 250 volts |
| From an adjustable series resistor having max. value of | 60000 ohms | 20000 ohms |
| DC Grid-No. 1 Voltage                 | -31 | -38 volts |
| From grid resistor of                 | 12000 ohms | 12000 ohms |
| From cathode resistor of              | 240 | 240 ohms |
| DC Plate Current                      | 120 | 150 ma |
| DC Grid-No. 2 Current (Approx.)       | 3 | 6 ma |
| DC Grid-No. 1 Current (Approx.)       | 2.6 | 3.2 ma |

- **At 100 Mc,** useful power output measured at load of output circuit is approximately 29 watts CCS and 36 watts ICAS.
- **Key-down conditions per tube without amplitude modulation.** Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- **Connected to a 400-volt tap on suitable voltage divider across the plate-supply voltage.**
- **At 100 Mc,** useful power output measured at load of output circuit is approximately 33 watts CCS and 52 watts ICAS.
- **Typical operation as an oscillator at 482 Mc is the same as that shown for amplifier service except that the useful power output measured at load of output circuit is approximately 9 watts CCS and 13 watts ICAS.

---

AUG. 16, 1954

TUBE DIVISION

TENTATIVE DATA 3

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
TWIN BEAM POWER TUBE

<table>
<thead>
<tr>
<th>Driver Power Output (Approx.)</th>
<th>7 watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>16 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: 30000 max. ohms

FREQUENCY TRIPLER — Class C

Maximum Ratings, Absolute Values:

For max. plate voltage and max. plate input above 100 Mc, see Rating Chart III

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>400 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No.2 (SCREEN) VOLTAGE</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 SUPPLY VOLTAGE</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-200 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>100 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>4 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>36 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>3 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>20 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
</tr>
<tr>
<td>to cathode</td>
<td>135 max. volts</td>
</tr>
<tr>
<td>to cathode</td>
<td>135 max. volts</td>
</tr>
</tbody>
</table>

Typical Operation as Tripler to 462 Mc:

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>300 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage (Approx.)</td>
<td>220 volts</td>
</tr>
<tr>
<td>From an adjustable series resistor having max. value of</td>
<td>30000 ohms</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-148 volts</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>51000 ohms</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>90 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Approx.)</td>
<td>5 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2.9 ma</td>
</tr>
</tbody>
</table>

When grid no.1 is driven positive, the total dc grid-no.1-circuit resistance should not exceed the specified value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

- Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-no.2 resistor should be used only when the 6524 is used in a circuit which is not keyed. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed. Grid-no.2 voltage must not exceed 400 volts under key-up conditions.
- Obtained from fixed supply, by grid-no.1 resistor, by cathode resistor, or by combination methods.

ISSUANCE OF AMERICA. HARRISON, NEW JERSEY
TWIN BEAM POWER TUBE

Driver Power Output (Approx.): 4 watts
Useful Power Output (Approx.): 7 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance: 60000 max. ohms

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
</table>
| Heater Current | 1    | 1.175| 1.325| amp
| Mu-Factor, Grid No.2 to Grid No.1 (Each Unit) | 1, 2 | 7 | 10 |
| Direct Interelectrode Capacitances (Each Unit): | | | |
| Grid No.1 to plate | 3 | 0.11 | μuf |
| Grid No.1 to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater | 3 | 5.8 | 8.2 | μuf |
| Plate to cathode & grid No.3 & internal shield, grid No.2 (pins 1 & 7), and heater | 3 | 2.6 | 4.2 | μuf |

Note 1: With 6.3 volts ac on heater.
Note 2: With dc plate voltage of 200 volts, dc grid-No.2 voltage of 200 volts, and dc plate current of 50 ma.
Note 3: With no external shield.

OPERATING CONSIDERATIONS

Shielding of the 6524 in rf service is required for stable operation. A convenient method of shielding is to mount the socket approximately 5/8" beneath a hole in the chassis plate so that when the 6524 is inserted in the socket, the internal shield (see Dimensional Outline) of the tube will be close to the edge of the hole and in the same plane as the chassis plate. This arrangement provides an effective shield to isolate the grid-No.1 circuits from the plate circuits.
RATING CHART I
CLASS C TELEPHONY

MAX. PLATE INPUT - WATTS

FREQUENCY - MC

INPUT-DC
VOLTAGE

OUTPUT-DC
VOLTAGE

MAX. PLATE VOLTS

0 100 200 300 400 500

0 200 400 600 800
**TWIN BEAM POWER TUBE**

**INDEX BOSS**

**NOTE I**


*For Notes, see next page.*
NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.0005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ± 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS YY'.

NOTE 2: THE PLATE LEADS WILL ENTER A FLAT-PLATE PLATE-LEAD GAUGE HAVING MINIMUM THICKNESS OF 0.375" AND HAVING TWO HOLES 0.1200" ± 0.0005" WHOSE CENTERS ARE LOCATED AT A DISTANCE OF 0.343" ± 0.001" FROM THE AXIS YY' AND WHOSE AXES ARE PARALLEL TO YY'. THE PLANE THROUGH THESE AXES WILL BE 90° ± 5' FROM THE PLANE THROUGH YY' AND PIN NO. 4.

NOTE 3: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.
AVERAGE PLATE CHARACTERISTICS FOR EACH UNIT

$E_f = 6.3$ VOLTS
GRID-N$^2$ VOLT$S = 150$
AVERAGE CHARACTERISTICS FOR EACH UNIT

- $E_f = 6.3$ VOLTS
- GRID-N#2 VOLTS = 150
- GRID-N#1 VOLTS = $E_{C1}$

- $= I_{C2}$
- $= I_{C1}$

GRID-N#1 OR GRID-N#2 (IC2) MILLIAMPERES

PLATE VOLTS

AUG. 16, 1954

TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
AVERAGE PLATE CHARACTERISTICS FOR EACH UNIT

$E_F = 6.3$ VOLTS
GRID-N°2 VOLTS = 200
AVERAGE CHARACTERISTICS FOR EACH UNIT

\[ E_f = 6.3 \text{ VOLTS} \]
\[ \text{GRID-N} \# 2 \text{ VOLTS} = 200 \]
\[ \text{GRID-N} \# 1 \text{ VOLTS} = E_c \]

\[ = I_{C2} \]

\[ = I_{C1} \]

GRID-N \#1 (I_c) OR GRID-N \#2 (I_c) MILLIAMPERES

PLATE VOLTS

AUG. 16, 1954
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
CE-8352T
E_c = 6.3 VOLTS
GRID-N & 2 VOLTS = 250
CHARACTERISTICS CURVES

AVERAGE CHARACTERISTICS FOR EACH UNIT

E_c = 6.3 VOLTS
GRID-N°2 VOLS = 250
GRID-N°1 VOLS = E_C1

= I_C2

= I_C1

GRID-N°1 (I_C1) OR GRID-N°2 (I_C2) MILLIAMPERES

PLATE VOLTS

AUG. 16, 1954
TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
Fixed-Tuned Oscillator Triode

PENCIL TYPE WITH INTEGRAL RESONATORS
For Radiosonde Service at 1680 Mc

**GENERAL DATA**

**Electrical:**
- Heater, for Unipotential Cathode:
  - Voltage range (AC or DC) .................. 5.2 to 6.6 volts
  - Current at heater volts = 6.0 .............. 0.160 amp
- Frequency (Approx.) .................. 1680 Mc
- Frequency Adjustment Range  ............... ±12 Mc
- RF Coaxial Output Terminal:
  - Characteristic impedance (Approx.) ... 50 ohms

**Mechanical:**
- Operating Position .................. Any
- Dimensions .................................. See Dimensional Outline
- Resonators (Two) .................. Integral Part of Tube
- Terminal Connections (See Dimensional Outline):

**FIXED-TUNED OSCILLATOR SERVICE**

<table>
<thead>
<tr>
<th>Maximum and Minimum Ratings, Absolute-Maximum Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.................................................. 120 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT................................................. 34 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT................................................... 8 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT......................................................... 4 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION.................................................. 3.6 max. watts</td>
</tr>
<tr>
<td>AMBIENT-TEMPERATURE RANGE...................................... -55 to +75 °C</td>
</tr>
</tbody>
</table>

**Operating Frequency Drift:**

Maximum Frequency Drift:
- For heater voltage range of 5.2 to 6.6 volts, plate voltage range of 95 to 117 volts, and ambient-temperature range of +22°C to -40°C .................. ±4 to -1 Mc

---

*RADIO CORPORATION OF AMERICA*

Electron Tube Division

Harrison, N. J.
CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.135</td>
<td>0.148</td>
</tr>
<tr>
<td>Power Output</td>
<td>2,4</td>
<td>~</td>
<td>600</td>
</tr>
<tr>
<td>Power Output</td>
<td>3,4</td>
<td>300</td>
<td>~</td>
</tr>
</tbody>
</table>

**Note 1:** With 5.2 volts ac on heater.

**Note 2:** With ac heater voltage of 6.6 volts, dc plate voltage of 117 volts, frequency of 1680 Mc, and grid resistor having resistance value within the range of 1300 to 2400 ohms, such that the dc plate current will not exceed 34 milliamperes. The value used for any individual tube is stamped on the tube and is one of the following standard values: 1300, 1500, 1800, 2200, or 2400 ohms.

**Note 3:** With ac heater voltage of 5.2 volts, dc plate voltage of 95 volts, frequency of 1680 Mc, and grid-resistor value specified in Note 2 above. When this value of resistance is used, the dc plate current will not exceed 34 milliamperes under the specified operating conditions.

**Note 4:** Measured with a coaxial-type load having an impedance of approximately 50 ohms and adjusted for a maximum voltage standing wave ratio of 1.1.

**OPERATING CONSIDERATIONS**

The flexible heater leads of the 6562/5794A are usually soldered to the circuit elements. Soldering of these connections should not be made closer than 3/4" from the end of the tube (excluding cathode tab). If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube. Under no circumstances should any of the electrodes be soldered to the circuit elements. Connections to the electrodes should be made by spring contact only.

The 6562/5794A should be supported by a suitable clamp around the metal shell either above or below the frequency-adjustment screw. It is essential, however, that the pressure exerted on the shell by the clamp be held to a minimum because excessive pressure can distort the resonators and result in a change of frequency.

The plate connection should have a flexible lead which will accommodate variations in the relative position of the plate terminal in individual tubes.

The 6562/5794A may be mechanically tuned by adjustment of the frequency-adjustment screw located on the metal shell of the tube. A clockwise rotation of the frequency-adjustment screw will decrease the frequency, while a counter-clockwise rotation will increase the frequency. The range of adjustment provided by the screw is ± 12 Mc.
BEAM POWER TUBE

GENERAL DATA

Electrical:
- Filament, 2-Section Multistrand Thoriated Tungsten:
  - Voltage per section (AC or DC): 1.25 min.° volts
  - Typical voltage: 1.35 volts
  - Maximum voltage: 1.50 volts
  - Current per section at 1.35 volts: 1000 amp
  - Starting current per section: Must never exceed 1200 amperes, even momentarily
  - Cold resistance per section: 0.00025 ohm
  - Minimum heating time: 30 sec
- Mu-Factor, Grid No.2 to Grid No.1 (Approx.) for plate volts = 9300, grid-No.2 volts = 950, and plate amperes = 4.3
- Direct Inter-electrode Capacitances:
  - Grid No.1 to plate: 0.1 max. μf
  - Grid No.1 to filament and grid No.2: 365 μf
  - Plate to filament and grid No.2: 30 μf
- Internal Bypass Capacitors between Grid No.2 and Cathode (Approx., total): 18000 μf

Mechanical:
- Operating Position: Tube axis vertical, with plate terminal either up or down
- Overall Length: 7.59" + 0.38" - 0.50"
- Maximum Diameter: 11.38"
- Weight (Approx.): 28 lbs

Terminal Connections (See Dimensional Outline):

- F1 - Fil. Sect. No.1 & Water Conn.
- F2 - Fil. Sect. No.2 & Water Conn.
- G1 - RF Grid-No.1 Term. Contact Surface
- G1w - DC Grid-No.1 & Water Conn.
- G2 - DC Grid-No.2 & Water Conn.
- Kr - RF Cath. Term. Contact Surface For RF Circuit Returns
- FM - Common Point of Fil. Sections for DC Circuit Returns, Ground, & Water Conn.
- PW - DC Plate & Water Conn.
- P - RF Plate Term. Contact Surface

For use at frequencies from 225 to 1000 Mc.
BEAM POWER TUBE

Air Cooling:
Forced-air cooling of the ceramic bushing at the grid-No.1 seal and at the plate seal may be required in order to limit the temperature of the ceramic bushing at either seal to the specified maximum value of 150°C. Under such conditions, provision should be made for blowing air at the ceramic bushings through suitable openings in the coaxial-cylinder cavity circuit.

Water Cooling:
Water cooling of the filament-section blocks, rf cathode terminals, grid-No.1 block, grid-No.2 block, and plate is required. The water flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the water flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow.

Water Flow:

<table>
<thead>
<tr>
<th></th>
<th>Absolute Flow</th>
<th>Typical Flow</th>
<th>Pressure Differential for Typical Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min. gpm</td>
<td>Typical gpm</td>
<td>psi</td>
</tr>
<tr>
<td>Through filament-section-No.1 block</td>
<td>0.5</td>
<td>1.2</td>
<td>17 max.</td>
</tr>
<tr>
<td>Through filament-section-No.2 block</td>
<td>0.5</td>
<td>1.2</td>
<td>17 max.</td>
</tr>
<tr>
<td>Through filament-common-point connection</td>
<td>0.5</td>
<td>1.2</td>
<td>11 max.</td>
</tr>
<tr>
<td>Through grid-No.1 block</td>
<td>0.5</td>
<td>1.2</td>
<td>9 max.</td>
</tr>
<tr>
<td>Through grid-No.2 block</td>
<td>0.5</td>
<td>1.2</td>
<td>17 max.</td>
</tr>
</tbody>
</table>

Dimensional Outline:
For plate dissipation up to 16 kw:

- 12 gpm
- 14 gpm

For plate dissipation of 20 kw:

- 14 gpm
- 16 gpm

For plate dissipation of 32 kw:

- 20 gpm
- 22 gpm

Gauge Pressure at Any Inlet
- Except Plate Inlet: 70 max. psi
- Gauge Pressure at Plate Inlet: 100 max. psi
- Ceramic-Bushing Temperature: 150 max. °C
- Outlet-Water Temperature (Any outlet): 70 max. °C
- Min. Plate-Water-Column Resistance: 4 megohms per kv of dc plate voltage at 25°C
### Maximum CCS* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td></td>
<td>9000 max. volts</td>
</tr>
<tr>
<td>DC PLATE-SUPPLY VOLTAGE</td>
<td></td>
<td>10000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td></td>
<td>1250 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 SUPPLY VOLTAGE</td>
<td></td>
<td>1350 max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td></td>
<td>7 max. amp</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT</td>
<td></td>
<td>60000 max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td></td>
<td>750 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td></td>
<td>35000 max. watts</td>
</tr>
</tbody>
</table>

* Maximum CCS ratings apply to operation at 225 to 1000 Mc.

### Typical CCS Operation:

- **At 550 Mc**
  - DC Plate Voltage: 8000 volts
  - DC Grid-No.2 Voltage: 1200 volts
  - DC Grid-No.1 (Control-grid) Voltage: -115 volts
  - Zero-Signal DC Plate Current: 2.5 amp
  - Max.-Signal DC Plate Current: 6 amp
  - Zero-Signal DC Grid-No.2 Current (Approx.): 0.15 amp
  - Max.-Signal DC Grid-No.2 Current (Approx.): 0.35 amp
  - Max.-Signal DC Grid-No.1 Current (Approx.): 0 amp
  - Max.-Signal Driver Power Output (Approx.): 90 watts
  - Output-Circuit Efficiency (Approx.): 90 %
  - Max.-Signal Useful Power Output (Approx.): 15000 watts

* RF POWER AMPLIFIER — Class B Television Service
* Synchronizing-level conditions per tube unless otherwise indicated

### Maximum CCS* Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td></td>
<td>9000 max. volts</td>
</tr>
<tr>
<td>DC PLATE-SUPPLY VOLTAGE</td>
<td></td>
<td>10000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td></td>
<td>1100 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 SUPPLY VOLTAGE</td>
<td></td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td></td>
<td>8.25 max. amp</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) CURRENT</td>
<td></td>
<td>0.5 max. amp</td>
</tr>
</tbody>
</table>

* Indicates a change.

---

**RCA 6806**

**BEAM POWER TUBE**

**LINEAR RF POWER AMPLIFIER**

Class AB Single-Sideband Suppressed-Carrier Service

Crest of modulation conditions

---

**ELECTRON TUBE DIVISION**

**RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY**
**BEAM POWER TUBE**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLATE INPUT</td>
<td>7000 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT (For black picture)*</td>
<td>750 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION (For black picture)*</td>
<td>36000 max. watts</td>
</tr>
</tbody>
</table>

**Typical CCS Operation:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth of 550 Mc</td>
<td>7</td>
</tr>
<tr>
<td>Bandwidth of 800 Mc</td>
<td>7</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>8500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-140</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>180</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>140</td>
</tr>
<tr>
<td>Blanking level</td>
<td>140</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>8</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>7.8</td>
</tr>
<tr>
<td>Blanking level</td>
<td>5.6</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>(Approx.)</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.75</td>
</tr>
<tr>
<td>Blanking level</td>
<td>0.55</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>(Approx.)</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.4</td>
</tr>
<tr>
<td>Blanking level</td>
<td>0.15</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td>(Approx.)*</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.75</td>
</tr>
<tr>
<td>Blanking level</td>
<td>0.55</td>
</tr>
<tr>
<td>Output-Circuit Efficiency</td>
<td>(Approx.)</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>800</td>
</tr>
<tr>
<td>Blanking level</td>
<td>450</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>(Approx.)</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>28000</td>
</tr>
<tr>
<td>Blanking level</td>
<td>17000</td>
</tr>
</tbody>
</table>

**PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony**

*Carrier conditions per tube for use with a maximum modulation factor of 1 unless otherwise indicated.*

**Maximum CCS* Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>5500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE.</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>PEAK GRID-No.2 VOLTAGE (DC + max. modulation swing)</td>
<td>1350 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE.</td>
<td>-250 max. volts</td>
</tr>
</tbody>
</table>

*See next page.*

\(^*\) Indicates a change.

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**DATA 2**
### RF Power Amplifier — Class C Telegraphy

#### Maximum CCS Ratings, Absolute Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>250 to 1000 Mc</th>
<th>400 Mc</th>
<th>900 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>9000 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC PLATE-SUPPLY VOLTAGE</td>
<td>10000 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>11000 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.2 SUPPLY VOLTAGE</td>
<td>12000 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-250 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>7 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>0.5 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>60000 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>750 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>35000 max.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Typical CCS Operation:

#### At 400 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>8500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-175</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>215</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>6.75</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Approx.)</td>
<td>0.5</td>
</tr>
</tbody>
</table>

#### At 900 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-175</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>235</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>6.8</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (Approx.)</td>
<td>0.55</td>
</tr>
</tbody>
</table>

*Indicates a change.*
**BEAM POWER TUBE**

### DC Grid-No.1 Current

<table>
<thead>
<tr>
<th>Approx.</th>
<th>At 400 Hz</th>
<th>At 900 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>amp</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Driver Power Output

<table>
<thead>
<tr>
<th>Approx.</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300</td>
</tr>
<tr>
<td><strong>watts</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>750</td>
</tr>
</tbody>
</table>

### Output-Circuit Efficiency

<table>
<thead>
<tr>
<th>Approx.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90</td>
</tr>
<tr>
<td><strong>%</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

### Useful Power Output

<table>
<thead>
<tr>
<th>Approx.</th>
<th>Watts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25000**</td>
</tr>
<tr>
<td><strong>watts</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13500**</td>
</tr>
</tbody>
</table>

* To avoid undue thermal stresses in the filament, it is essential that the filament voltage be raised gradually to operating value in not less than 30 seconds. When the filament voltage is removed, it should be reduced gradually from the normal operating value to zero voltage in not less than 30 seconds.

Minimum operating value. The life of the tube can be conserved by operating the tube in the lowest power, within the operating filament-voltage range, which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value provides emission in excess of any requirements within the tube ratings, the filament power must be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament power supply is in general economically advantageous from the viewpoint of tube life. During standbys, the filament may be operated at 1.08 volts.

* Directly across cooled element at water connection for the indicated typical flow.

Continuous Commercial Service.

Maximum voltage ratings apply for pressures down to 25 inches of mercury (altitudes up to 5000 feet) at 235°C.

In the vicinity of 550 Hz, it may be necessary to provide means for balancing out a circumferential TE1,1 mode.

obtained preferably from a separate source.

The driver stage is required to supply tube losses, rf-circuit losses, and rf "swamping-power" losses. "Swamping" may be required in practical circuit design to obtain the desired input-circuit bandwidth. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

This value of useful power is measured at load with output circuit having indicated efficiency.

Continuous blanking level + sync pulses.

**Between the half-power points as measured in the output circuit.**

This value includes 300 watts of rf "swamping power".

This value includes 100 watts of rf "swamping power".

For 100% modulation of plate voltage, and 50% modulation of grid-No. 2 voltage.

The driver stage is required to supply tube losses and rf-circuit losses. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 11% of the carrier conditions.

obtained preferably from a separate source or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No. 2 resistor should not be used if the 6806 or a preceding stage is keyed. In this case, the regulation of the source should be sufficient to prevent the grid-No. 2 voltage from rising above 1200 volts under key-up conditions; and additional fixed grid-No. 1 bias must be provided to limit the plate current.

obtained from fixed supply, by grid-No. 1 resistor, by cathode resistor, or by combination methods.

---

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
### Beam Power Tube Characteristics Range Values for Equipment Design

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current per Section</td>
<td>1</td>
<td>950</td>
<td>1050</td>
</tr>
<tr>
<td>Filament Current per Section</td>
<td>2</td>
<td>985</td>
<td>1095</td>
</tr>
<tr>
<td>Filament-Current Differential</td>
<td>1</td>
<td>–</td>
<td>30</td>
</tr>
<tr>
<td>Filament-Voltage Differential</td>
<td>3</td>
<td>–</td>
<td>0.075 volt</td>
</tr>
<tr>
<td>Grid-No.1 Voltage</td>
<td>1,4</td>
<td>–</td>
<td>-180 volt</td>
</tr>
</tbody>
</table>

**Useful Power Output:**

- **Class B Television Service—**
  - Synchronizing-level conditions: 1.5 27000 – watts
- **Class C Telegraphy—**
  - Key-down conditions: 1.6 22000 – watts

**Power Gain:**

- 1, 5, 6, 7 40 –

**Notes:**

1. With 1.35 volts rms per filament section.
2. With 1.5 volts rms per filament section.
3. With 1000 amperes per filament section.
4. With 2-phase excitation of the filament sections, dc plate volts = 8500, dc grid-No.2 volts = 1000, and dc grid-No.1 voltage adjusted to give a dc plate current of 0.25 amperes.
5. With 2-phase excitation of the filament sections. In rf power amplifier circuit having a bandwidth of 7 Mc as defined by the half-power points and with dc plate volts = 8750, dc grid-No.2 volts = 1000, dc grid-No.1 voltage adjusted to give a zero-signal dc plate current of 0.25 amperes, drive adjusted to give synchronizing-level dc plate current of 8 amperes, and frequency (Mc) = 550.
6. With 2-phase excitation of the filament sections. In rf power amplifier circuit, and with dc plate volts = 8500, dc grid-No.2 volts = 1000, dc grid-No.1 voltage adjusted to give a zero-signal dc plate current of 0.25 amperes, drive adjusted to give dc plate current of 7 amperes, and frequency (Mc) = 550.
7. With driving power measured at input to input-cavity circuit fed by transmission line having voltage-standing-wave ratio not greater than 1.5. Power gain is ratio of useful power output to driving power.
NOTE 1: TERMINAL HAS 1" - 16 UNIFIED THREAD CLASS 2A FIT, 0.38" LONG AND 2 HOLES 0.258" - 0.270" DIAMETER SPACED 0.438" ON CENTERS.


NOTE 3: THE WATER CONNECTION FOR THE PLATE HAS 1-3/4" - 16 UNIFIED EXTRA FINE THREAD, CLASS 2A FIT, 0.38" LONG, 2 HOLES 0.508" - 0.522" DIAMETER SPACED 0.688" ON CENTERS, AND AN INDEX HOLE 0.160" MAX. DIAMETER SPACED 0.344" FROM THE CENTER OF THE TERMINAL.


NOTE 5: PRESSURE FROM CIRCUIT CONTACTS SHOULD BE EXERTED ONLY OVER 0.31" MAX. LENGTH OF DESIGNATED CONTACT AREAS OF THE PLATE OR GRID-No. 1 TERMINALS.

NOTE 6: THE DIAMETER DIMENSION IS HELD ONLY OVER A LENGTH OF 0.31" MIN.

NOTE 7: THIS DIMENSION APPLIES OVER A LENGTH OF 0.50" MIN. AS INDICATED.

NOTE 8: THE CONTACT SURFACES, BA-BA1 AND BB-BB1, ARE PARALLEL WITHIN 0.06".

NOTE 9: CONTACT OF THE INPUT-END RF CATHODE TERMINAL SHOULD NOT BE MADE AT A DIAMETER SMALLER THAN 4.22".

NOTE 10: TO PREVENT EXCESSIVE STRESS ON THE CERAMIC SEAL, A 15/16" OPEN-END WRENCH MUST BE USED TO PERMIT GRIPPING THE TERMINAL WHEN REMOVING OR TIGHTENING THE WATER CONNECTORS.

NOTE 11: CONTACT OF THE OUTPUT-END RF CATHODE TERMINAL SHOULD NOT BE MADE AT A DIAMETER SMALLER THAN 4.22". THE PRESSURE EXERTED FOR THIS RF CONTACT SHOULD BE LIMITED TO THAT NECESSARY FOR GOOD ELECTRICAL CONTACT. THE MECHANICAL FORCE FOR THE CAVITY SUPPORT SHOULD BE MADE AT A DIAMETER NOT LESS THAN 4.22". ON THE OUTPUT-END RF CATHODE TERMINAL, THERE ARE FOUR EQUALLY SPACED 0.188"-DIAMETER HOLES ON A CIRCLE HAVING DIAMETER OF 6.75". THESE HOLES ARE FOR TUBE MANUFACTURING PURPOSES ONLY. ATTENTION IS CALLED TO THE EXISTENCE OF THESE HOLES SO THAT EQUIPMENT DESIGNERS CAN AVOID MAKING ELECTRICAL CONTACT AT POINTS WHICH ARE COINCIDENT WITH THESE HOLES. MECHANICAL CLAMPING DEVICES FOR THE OUTPUT CAVITY SHOULD BE DESIGNED SO AS TO EXERT THEIR CLAMPING FORCE ACROSS THE OUTER EDGE OF THE OUTPUT-HEADER FLANGE.

NOTE 12: SERIAL NUMBER IS LOCATED ON THIS SURFACE BETWEEN DC GRID-No. 2 AND FILAMENT-SECTION-No. 1 CONNECTIONS.
NOTE 13: CORNERS MAY BE ROUNDED OR CHAMFERED, AS INDICATED IN (A) AND (B), NOT TO EXCEED 0.05".

GAUGE G₁

2 PINS
0.256" ± 0.000" - 0.001" DIA.

0.219" ± 0.001"
0.438" ± 0.002"

TAPPED FOR 1"-16 UNIFIED THREAD, CLASS 2B, 0.300" - 0.350" LONG

CYLINDER (NOTE 1)

.188" ± 0.001" - 0.000"

.910" ± 0.001" - 0.000" DIA.

.895" ± 0.000" DIA.

PLUG (NOTE 2)

NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN 0.002".

NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN 0.001".
NOTE 1: TAPPED SECTION OF CYLINDER MUST BE CONCENTRIC WITH UNTAPPED SECTION OF CYLINDER WITHIN .002".
NOTE 2: PLUG SIDES & PIN SIDES MUST BE PARALLEL WITHIN .001"
TYPICAL FITTING LAYOUT FOR ALL WATER CONNECTIONS OTHER THAN THAT FOR PLATE

1/2" DIA.

2 HOLES .255" DIA.
C'BORE .400" DIA. x .040" DEEP

.438" DIA.

"O" RING GASKET **
1/4" I.D., 3/8" O.D.

900" DIA.

.9" .06""

.250" DIA.

.75" DIA.

1/4" O.D. METAL TUBING TO STANDARD HOSE CONNECTION

** DWG. No. 24849-5, GARLOCK PACKING CO., PALMYRA, N.Y.

For essential design tolerances, see Gauge G₂
TYPICAL FITTING LAYOUT FOR PLATE WATER CONNECTION

INDEX PIN .06" DIA.

.344" DIA.

2 HOLES .510" DIA.

C'BORE .720" DIA. X .060" DEEP

INDEX PIN .06" DIA.

.344" DIA.

1.88" DIA.

THREADED FOR 1 3/16"-16 CLASS 2B

1/2" O.D. METAL TUBING TO STANDARD HOSE CONNECTION

"O" RING GASKET*

1/2" I.D., 1/16" O.D.

1.62" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.

.344" DIA.
PLATE COOLING REQUIREMENTS

WATER FLOW TO PLATE—GALLONS PER MINUTE

PLATE DISSIPATION—KILOWATTS

TYPICAL
ABSOLUTE MINIMUM

0 10 20 30 40
0 10 20 30 40

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

E = ADJUSTED TO SIMULATE NORMAL OPERATING GRID N-2 VOLTS = 0.000
PLATE AMPERES = 30

GRID-N-2 VOLTS = 0.000

PLATE VOLTS

0.000 1000 2000 3000 4000 5000 6000 7000 8000 9000 1000

0.5 0.6 0.7 0.8 0.9 1.0

PLATE TRANSISTOR DIVISION

ELECTRONIC DIVISION

RCA CHICAGO DIVISION
$E_f = \text{ADJUSTED TO SIMULATE NORMAL OPERATING CONDITION OF FILAMENT IN UHF SERVICE}$

GRID-N\#2 VOLTS = 1000
Beam Power Tube

CERMOLOX TYPE

OXIDE-COATED CATHODE

80 WATTS CW POWER OUTPUT

FORCED-AIR COOLED

40 WATTS CW POWER OUTPUT

AT 400 MHz

AT 1215 MHz

For Use in Compact Aircraft, Mobile, and Stationary Equipment

ELECTRICAL

Heater, for Unipotential Cathode

Voltage (AC or DC) .................. 6.3 typ V

Current at heater volts = 6.3 ........ 2.1 A

Minimum heating time ............... 60 s

Mu-Factor, Grid No.2 to Grid No.1 .... 18

Direct Interelectrode Capacitances

Grid No.1 to plate ................. 0.065 max pF

Grid No.1 to cathode & heater .... 13.0 pF

Plate to cathode & heater ........ 0.013 max pF

Grid No.1 to grid No.2 .......... 18.0 pF

Grid No.2 to plate ................. 4.8 pF

Grid No.2 to cathode & heater .. 0.45 max pF

MECHANICAL

Operating Position .................. Any

Overall Length ..................... 1.93 max in

Greatest Diameter .................. 1.265 max in

Weight (Approx.) ................... 2 oz

Radiator .......................... Integral part of tube

For operation up to 400 MHz

Socket including Grid-No.2 Bypass Capacitor .... Erie b 2948-000, E.F. Johnson c DN124-152-1 Jettron d 89-001, or equivalent

Grid-No.2 Bypass Capacitor ........ Erie b 2926-000, 2929-001, or equivalent

For operation at high frequencies

See Preferred Mounting Arrangement

TERMINAL DIAGRAM (See Dimensional Outline)

G1 - Grid No.1-Terminal Contact Surface

G2 - Grid No.2-Terminal Contact Surface

H - Heater-Terminal Contact Surface

H,K - Heater- & Cathode-Terminal Contact Surface

P - Plate Terminal Contact Surface

— indicates a change.
THERMAL

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

See Dimensional Outline for temperature—measurement points

Air Flow (See Typical Cooling Requirements)

AF POWER AMPLIFIER & MODULATOR — Class AB1

Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC plate voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC grid-No.2 (screen-grid) voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>Max.—signal dc plate current</td>
<td>180 mA</td>
</tr>
<tr>
<td>Max.—signal plate input</td>
<td>180 W</td>
</tr>
<tr>
<td>Max.—signal grid-No.2 input</td>
<td>4.5 W</td>
</tr>
<tr>
<td>Plate dissipation</td>
<td>115 W</td>
</tr>
</tbody>
</table>

Typical CCS Operation

Values are for 2 tubes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>650 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>-15 V</td>
</tr>
<tr>
<td>From fixed-bias source</td>
<td></td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>30 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>80 mA</td>
</tr>
<tr>
<td>Max.—Signal DC Plate Current</td>
<td>200 mA</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current</td>
<td>0 mA</td>
</tr>
<tr>
<td>Max.—Signal DC Grid-No.2 Current</td>
<td>20 mA</td>
</tr>
<tr>
<td>Effective Load Resistance</td>
<td>4330 Ω</td>
</tr>
<tr>
<td>Plate to plate</td>
<td></td>
</tr>
<tr>
<td>Max.—Signal Driving Power (Approx.)</td>
<td>0 W</td>
</tr>
<tr>
<td>Max.—Signal Power Output (Approx.)</td>
<td>50 W</td>
</tr>
</tbody>
</table>

Maximum Circuit Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance Under Any Condition With fixed-bias</td>
<td>30000 Ω</td>
</tr>
<tr>
<td>With cathode-bias Not recommended</td>
<td></td>
</tr>
</tbody>
</table>

AF POWER AMPLIFIER & MODULATOR — Class AB2

Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC plate voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC grid-No.2 (screen-grid) voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>Max.—signal dc plate current</td>
<td>180 mA</td>
</tr>
<tr>
<td>Max.—signal dc grid-No.1 (control grid) current</td>
<td>30 mA</td>
</tr>
<tr>
<td>Max.—signal plate input</td>
<td>180 W</td>
</tr>
<tr>
<td>Max.—signal grid-No.2 input</td>
<td>4.5 W</td>
</tr>
<tr>
<td>Plate dissipation</td>
<td>115 W</td>
</tr>
</tbody>
</table>

Typical CCS Operation

Values are for 2 tubes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>650 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-15 V</td>
</tr>
</tbody>
</table>
**Peak envelope conditions for a signal having a minimum peak-to-average power ratio of 2**

**Maximum CCS Ratings, Absolute-Maximum Values**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC plate voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC grid-No.2 voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC grid-No.1 voltage</td>
<td>100 V</td>
</tr>
<tr>
<td>DC plate current at peak of envelope</td>
<td>350 mA</td>
</tr>
<tr>
<td>DC grid-No.1 current</td>
<td>30 mA</td>
</tr>
<tr>
<td>Plate input</td>
<td>180 W</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>4.5 W</td>
</tr>
<tr>
<td>Plate dissipation</td>
<td>115 W</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>650 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>18.5 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>40 mA</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>2200 Ω</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>100 mA</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>75 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td>8.2 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>3.6 mA</td>
</tr>
<tr>
<td>Peak-Envelope Driver Power Output (Approx.)</td>
<td>0.5 W</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 %</td>
</tr>
<tr>
<td>Distortion Products Level</td>
<td>35 dB</td>
</tr>
<tr>
<td>Third Order</td>
<td>40 dB</td>
</tr>
<tr>
<td>Fifth Order</td>
<td>30 dB</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>12.5 W</td>
</tr>
<tr>
<td>Average</td>
<td>25 W</td>
</tr>
<tr>
<td>Peak envelope</td>
<td>40 W</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance Under Any Condition</td>
<td>25000 Ω</td>
</tr>
<tr>
<td>With fixed bias</td>
<td>100000 Ω</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Grid-No.2 Circuit Impedance</td>
<td>See Footnote k</td>
</tr>
<tr>
<td>Plate Circuit Impedance</td>
<td>See Footnote m</td>
</tr>
</tbody>
</table>

**LINEAR RF POWER AMPLIFIER, Class AB 1 J**

Single-Sideband Suppressed-Carrier Service

Peak envelope, DC Plate Current, DC grid-No.2 current, and effective RF load resistance are measured with fixed bias, whereas DC grid-No.1 current, effective RF load resistance, and distortion products level are measured with cathode bias.
### PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

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

### Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC plate voltage</td>
<td>800 V</td>
</tr>
<tr>
<td>DC grid-No.2 (screen-grid) voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC grid-No.1 (control-grid) voltage</td>
<td>100 V</td>
</tr>
<tr>
<td>DC plate current</td>
<td>150 mA</td>
</tr>
<tr>
<td>DC grid-No.1 current</td>
<td>30 mA</td>
</tr>
<tr>
<td>Plate input</td>
<td>120 W</td>
</tr>
<tr>
<td>Grid-No.2 input</td>
<td>3 W</td>
</tr>
<tr>
<td>Plate dissipation</td>
<td>75 W</td>
</tr>
</tbody>
</table>

### Typical CCS Operation

<table>
<thead>
<tr>
<th>Voltage Condition</th>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
<th>Driver Power Output</th>
<th>Useful Power Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Voltage</td>
<td>400 V</td>
<td>200 V</td>
<td>-20 V</td>
<td>100 mA</td>
<td>5 mA</td>
<td>5 mA</td>
<td>2 W</td>
<td>16 W</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>700 V</td>
<td>250 V</td>
<td>-50 V</td>
<td>130 mA</td>
<td>10 mA</td>
<td>10 mA</td>
<td>3 W</td>
<td>45 W</td>
</tr>
</tbody>
</table>

### Maximum Circuit Values

**Grid-No.1 Circuit Resistance**

Under Any Condition: 30000 Ω

---

### RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

*and*

### RF POWER AMPLIFIER — Class C FM Telephony

### Maximum CCS Ratings, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC plate voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC grid-No.2 voltage</td>
<td>300 V</td>
</tr>
<tr>
<td>DC grid-No.1 voltage</td>
<td>180 V</td>
</tr>
<tr>
<td>DC plate current</td>
<td>30 mA</td>
</tr>
<tr>
<td>DC grid-No.2 current</td>
<td>180 mA</td>
</tr>
<tr>
<td>Plate input</td>
<td>4.5 W</td>
</tr>
<tr>
<td>Grid-No.2 input</td>
<td>115 W</td>
</tr>
</tbody>
</table>

### Typical CCS Operation

<table>
<thead>
<tr>
<th>Voltage Condition</th>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
<th>Driver Power Output</th>
<th>Useful Power Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Voltage</td>
<td>400 V</td>
<td>200 V</td>
<td>-35 V</td>
<td>150 mA</td>
<td>5 mA</td>
<td>3 mA</td>
<td>3 W</td>
<td>23 W</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>900 V</td>
<td>300 V</td>
<td>-22 V</td>
<td>170 mA</td>
<td>1 mA</td>
<td>10 mA</td>
<td>3 W</td>
<td>80 W</td>
</tr>
</tbody>
</table>

### DATA 2

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.
### Maximum Circuit Value

**Grid-No.1-Circuit Resistance**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Any Condition</td>
<td>30000</td>
<td>Ω</td>
</tr>
</tbody>
</table>

**Note:** Measured with special shield adapter.

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td></td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitance</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate.</td>
<td>1</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
<td>2</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td>2</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>2</td>
</tr>
<tr>
<td>Grid No.2 to plate.</td>
<td>2</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
<td>2</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1.3</td>
</tr>
<tr>
<td>4. Grid-No.1 Cutoff Voltage</td>
<td>1.4</td>
</tr>
<tr>
<td>5. Grid-No.1 Current</td>
<td>1.5</td>
</tr>
<tr>
<td>6. Reverse Grid-No.1 Current</td>
<td>1.8</td>
</tr>
<tr>
<td>7. Grid-No.2 Current</td>
<td>1.3</td>
</tr>
<tr>
<td>8. Peak Emission</td>
<td>1.6</td>
</tr>
<tr>
<td>9. Interelectrode Leakage</td>
<td></td>
</tr>
<tr>
<td>10. Useful Power Output</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- 1: With 6.3 volts ac or dc on heater.
- 2: Measured with special shield adapter.
- 3: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 mA.
- 4: With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 mA.
- 5: With plate and grid-No.2 floating and dc grid-No.1 voltage of +2 volts.
- 6: With grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate 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).

Note 7: 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.

Note 8: In a single-tube, grid-drive coaxial-cavity class C amplifier circuit at 400 MHz and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between zero and 10000 ohms, dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3 watts.
**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 - 1.316"
- **b.** Plate Terminal - 1.119"
- **c.** Grid-No.2 Terminal - 1.019"
- **d.** Grid-No.1 Terminal - 0.764"
- **e.** Heater-Cathode Terminal - 0.519"
- **f.** Heater Terminal - 0.240"
- **g.** Axial Pin - 0.071"

**Note 2:** Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.
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., Little Falls, N.J.
RECOMMENDED COWLING FOR DIRECTING AIR FLOW THROUGH RADIATOR

AIR FROM BLOWER

Tuning Characteristics

GRID No.2 TO GRID No.1

CHARACTERISTIC IMPEDANCE = 40.4 OHMS

4/4 MODE

3 1/4 MODE

1/2 MODE

FREQUENCY—MHz

CAVITY LENGTH—L INCHES

GRID-No.2 TERMINAL
GRID-No.1 TERMINAL

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 5
7-67
TYPICAL COOLING REQUIREMENTS
With Cowling

AIR FLOW DIRECTED THROUGH RADIATOR WITH COWLING AS SHOWN IN ACCOMPANYING DIAGRAM.

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PRESSURE DROP—INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C, D, E</td>
<td>LESS THAN 0.1</td>
</tr>
</tbody>
</table>

MAX. ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMPERATURE OF 25 °C

PLATE—TERMINAL—TEMPERATURE RISE ABOVE INCOMING-AIR TEMPERATURE

PLATE DISSIPATION—WATTS

92CM-9219 RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
DATA 6
9-62
TYPICAL COOLING REQUIREMENTS
Without Cowling

AIR FLOW DIRECTED THROUGH RADIATOR FROM 1" x 1/2" ORIFICE LOCATED 1/4" FROM RADIATOR.

MAX. ALLOWABLE TEMPERATURE RISE WITH INCOMING AIR TEMPERATURE OF 25°C

PLATE DISSIPATION—WATTS

PLATE TERMINAL TEMPERATURE RISE ABOVE INCOMING AIR TEMPERATURE—°C

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Typical Constant-Current Characteristics
With Grid-No. Volts = 300

$E_f = 6.3$ VOLTS
GRID-No.2 VOLTS = 300
$IC_1 =$ GRID-No.1 MA.
$IC_2 =$ GRID-No.2 MA.
**6850 TWIN BEAM POWER TUBE**

Useful at frequencies up to 470 Mc

---

The 6850 is the same as the 6524 except for the following items:

**Heater, for Unipotential Cathode:**
- **Voltage:** $12.6 \pm 10\%$ ac or dc volts
- **Current:** 0.625 amp

---

**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.588</td>
</tr>
</tbody>
</table>

Note 1: With 12.6 volts ac on heater.
TRAVELING-WAVE TUBE
LOW-NOISE AMPLIFIER TYPE
Useful over frequency range of 2700 to 3500 Mc

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage ............... 5 ac or dc volts
Current at 5 volts ................ 0.65 amp
Starting current: The maximum instantaneous starting current must never exceed 4 amperes, even momentarily.
Minimum Cathode Heating Time .......... 1 minute
Frequency Range .................. 2700 to 3500 Mc
Cold Insertion Loss ............... 80 db

Mechanical:
Operating Position .................. Any
Cooling ......................... Natural
Maximum Overall Length ............ 19-3/8"
Metal-Shell Diameter .............. 1.375" ± 0.005"
Weight (Approx.) ................... 1-1/2 lbs
Collector-Terminal Connector ........ Birnbach No.403 Banana Jack
RF Connectors:
Input terminal ................. Type N UG-18B/U Plug
Output terminal .............. Type N UG-18B/U Plug
Base ......................... Octal 8-Pin

Maximum and Minimum Ratings, Absolute Values:

DC COLLECTOR VOLTAGE .............. 500 max. volts
DC HELIX VOLTAGE ................... 500 max. volts
DC GRID-No.4 VOLTAGE ............... 500 max. volts
DC GRID-No.3 VOLTAGE ............... 300 max. volts
DC GRID-No.2 VOLTAGE ............... 75 max. volts
DC GRID-No.1 VOLTAGE ............... 20 max. volts
DC COLLECTOR CURRENT ............. 500 max. µA
DC HELIX CURRENT .............. 5 max. µA
MAGNETIC FIELD STRENGTH ........ 400 min. 600 max. gausses
PEAK RF POWER INPUT ............. 100 max. watts
AVERAGE RF POWER INPUT .......... 0.4 max. watt
METAL-SHELL TEMPERATURE
(at hottest point) .............. 175 max. °C

△ During alignment of the tube in the magnetic-focusing field, the helix current may exceed this value for short periods, but should never exceed 25 µA.

*: See next page.

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
# Typical Operation at 3100 Mc:

<table>
<thead>
<tr>
<th>DC Collector Voltage</th>
<th>DC Helix Voltage</th>
<th>DC Grid-No.4 Voltage</th>
<th>DC Grid-No.3 Voltage</th>
<th>DC Grid-No.2 Voltage (Approx.)</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Collector Current</th>
<th>DC Helix Current</th>
<th>DC Grid-No.4 Current</th>
<th>DC Grid-No.3 Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 volts</td>
<td>375 volts</td>
<td>200 volts</td>
<td>40 volts</td>
<td>20 volts</td>
<td>0 volts</td>
<td>150 μA</td>
<td>0.5 μA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Magnetic-Field Strength: 525 ± 5% gausses
Gain (Low level): 25 db
Power Output (Saturated): 1 mw
Noise Figure: 6.5 db

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>0.45</td>
<td>0.85</td>
</tr>
<tr>
<td>Input VSWR (Non-operating)</td>
<td>0.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Output VSWR (Non-operating)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>DC Helix Voltage</td>
<td>350</td>
<td>390</td>
</tr>
<tr>
<td>DC Grid-No.4 Voltage</td>
<td>160</td>
<td>275</td>
</tr>
<tr>
<td>DC Grid-No.3 Voltage</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Saturated Power Output</td>
<td>0.25</td>
<td>-</td>
</tr>
<tr>
<td>Gain (Optimum)</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>7</td>
<td>-</td>
</tr>
</tbody>
</table>

### OPERATING CONSIDERATIONS

The magnetic field required for focusing the electron beam of the 6861 may be obtained from a solenoid or permanent magnet capable of providing a uniform field of 525 gausses over the length of the tube axis starting 2 inches from the groove near the base end of the metal shell and continuing for at least 9 inches along the tube axis.

*This value of field-strength will focus the electron beam, but noise figure will not be optimum.*

† For RCA Solenoid Type MW-4900.
TRAVELING-WAVE TUBE

COLLECTOR TERMINAL
(BIRNBACH BANANA JACK No. 403)

INPUT

1 1/8" MAX. - 1/2" MIN.

OUTPUT

1.380" MAX.

1.375" ± .005" DIA.

METAL SHELL

19 3/8" MAX.

17" MAX.

15 27/32" ± 1/32

DETAIL OF GROOVE AND KEYWAY

.125" ± .003"

1.428" ± .005"

9/64" ± .003"

1/16" ± 0.003"

1/2" MAX. OCTAL 8-PIN BASE

92CM-8951R1

CE-8951R1

ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
NOISE-FIGURE CHARACTERISTICS

\[ E_f = 5 \text{ VOLTS} \]
COLLECTOR VOLTS = 400
GRID-No.4 VOLTS = 200
GRID-No.3 VOLTS = 40
GRID-No.2 VOLTS ADJUSTED TO GIVE COLLECTOR MICROAMPERES = 150
GRID No.1 CONNECTED TO CATHODE AT SOCKET
SIGNAL FREQUENCY \((\text{Mc})\) = 3100
FIELD STRENGTH ALONG HELIX AXIS \((\text{GAUSSES})\) = 525
**NOISE - FIGURE CHARACTERISTICS**

\[ E_f = 5 \text{ VOLTS} \]
\[ \text{COLLECTOR VOLTS} = 400 \]
\[ \text{HELIX VOLTS} = 375 \]
\[ \text{GRID-No. 4 VOLTS} = 200 \]
\[ \text{GRID-No. 3 VOLTS} = 40 \]
\[ \text{GRID-No. 2 VOLTS ADJUSTED TO GIVE} \]
\[ \text{COLLECTOR MICROAMPERES} = 150 \]
\[ \text{GRID-No. 1 CONNECTED TO CATHODE AT SOCKET} \]
\[ \text{SIGNAL FREQUENCY (Mc)} = 3100 \]
\[ \text{FIELD STRENGTH ALONG HELIX AXIS} \]
\[ (\text{GAUSSES}) = 525 \]

**SATURATION CHARACTERISTICS**

\[ E_f = 5 \text{ VOLTS} \]
\[ \text{COLLECTOR VOLTS} = 600 \]
\[ \text{HELIX VOLTS} = 375 \]
\[ \text{GRID-No. 4 VOLTS} = 200 \]
\[ \text{GRID-No. 3 VOLTS} = 40 \]
\[ \text{GRID-No. 2 VOLTS ADJUSTED TO GIVE} \]
\[ \text{COLLECTOR MICROAMPERES} = 150 \]
\[ \text{GRID-No. 1 CONNECTED TO CATHODE AT SOCKET} \]
\[ \text{SIGNAL FREQUENCY (Mc)} = 3100 \]
\[ \text{FIELD STRENGTH ALONG HELIX AXIS} \]
\[ (\text{GAUSSES}) = 525 \]
INPUT—MATCHING CHARACTERISTIC

VOLTAGE STANDING-WAVE RATIO

FREQUENCY - Mc

WITH NO VOLTAGES APPLIED TO TUBE
Beam Power Tube

HIGH POWER SENSITIVITY

RCA "DARK HEATER" WITH 12- TO 15-VOLT RANGE

85 WATTS CW INPUT (ICAS) 50 WATTS CW INPUT (ICAS)

UP TO 60 Mc AT 175 Mc

CONTROLLED ZERO-BIAS

PLATE CURRENT

CONTROLLED POWER OUTPUT

AT REDUCED HEATER VOLTAGE

For RF Power Amplifier and Oscillator Service and as an
AF Power Amplifier and Modulator in Both Mobile and
Fixed Equipment. The 6883B/8032A/8552 is Unilaterally
Interchangeable with types 6883, 6883A, and 8032.

The 6883B/8032A/8552 is the same as the 6146B/8298A except for
the following items:

Electrical:

Heater, for Unipotential Cathode:

Voltage (AC or DC) .................. 12.6 volts

Current at heater volts = 12.6 .... 0.562 amp

Minimum heating time ............... 60 sec

Direct Interelectrode Capacitances:

Grid No.1 to plate .................. 0.24 max. pf

Note 1: With no external shield.

CHARACTERISTICS RANGE VALUES

Test No. Note Min. Max.

1 Direct Interelectrode Capacitances:

Grid No.1 to plate .................. 1 - 0.24 pf

SPECIAL PERFORMANCE DATA

Stationary Equipment Operation:

Heater, for Unipotential Cathode:

Voltage (AC or DC) .................. 12.6 volts

Current at 12.6 volts ................ 0.525 amp

Useful Power Output ................ 59 watts

Design Min. Center Max.

It is recommended that the design-center heater voltage be 12.6 volts;
the heater power supply should not fluctuate more than 1% to insure
long life.

In a single-tube, self-excited oscillator circuit, and with ac heater
voltage of 12.6 volts, dc plate voltage of 600 volts, dc grid-No.2
voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate
current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and
frequency of 15 Mc.

Indicates a change.
Mobile Equipment Operation:

Heater, for Unipotential Cathode:

<table>
<thead>
<tr>
<th>Design</th>
<th>Min.</th>
<th>Range</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (AC or DC)(^x)</td>
<td>12-15</td>
<td>volts</td>
<td></td>
</tr>
<tr>
<td>Current at 13.5 volts</td>
<td>0.550</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output I</td>
<td>59</td>
<td>watts</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output II</td>
<td>See Note Z</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^x\) It is recommended that the heater voltage operate within the range of 12.0 to 15.0 volts and within excursions from 10 to 15 volts in battery operation. See Useful Power Output Test II and Overvoltage Tests.

\(^y\) In a single-tube, self-excited oscillator circuit, and with ac heater voltage of 12.6 volts, dc plate voltage of 600 volts, dc grid-No.2 voltage of 200 volts, grid-No.1 resistor of 24,000 ± 10% ohms, dc plate current of 150 max. ma., dc grid-No.1 current of 2.5 to 3 ma., and frequency of 15 Mc.

\(^z\) With conditions in note (y) above, reduce heater voltage to 10 volts. Useful power output will be at least 90% of the power output at heater voltage of 12.6 volts.

Overvoltage Heater Life Tests:

Continuous heater life tests are performed periodically on sample lots of tubes with 16 volts on the heater, all other electrodes "floating". Intermittent heater life tests are performed periodically on sample lots of tubes with 22 volts on the heater, a cycle of 1 minute "ON" and 4 minutes "OFF". After 1000 hours of the continuous heater life test and after 48 hours of the intermittent heater life test, the following tests are performed:

With heater voltage of 13.5 volts and ± 100 dc volts between cathode and heater, the heater-cathode leakage current will not exceed 100 microamperes.

With ac or dc heater voltage of 13.5 volts, grid-No.1 volts = -200 and cathode, grid No.2, and plate grounded, the minimum grid-No.1 leakage resistance will be 10 megohms.

With ac or dc heater voltage of 13.5 volts, plate volts = -200, and cathode grid No.1 and grid No.2 grounded, the minimum plate leakage will be 10 megohms.

\(\rightarrow\) Indicates a change.
Beam Power Tube

OXIDE-COATED CATHODE FORCED-AIR COOLED
80 WATTS CW POWER OUTPUT 40 WATTS CW POWER OUTPUT
AT 400 MHz AT 1215 MHz

For Use in Compact Aircraft, Mobile, and Stationary Equipment

The 6884 is the same as the 6816 except for the following items:

Heater, for Unipotential Cathode

Voltage (AC or DC) .................. \( \frac{26.5 \, \text{typ}}{29.2 \, \text{max}} \) V
Current at heater volts = 26.5 .................. 0.54 A

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>0.48 A</td>
<td>0.60 A</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>80 W</td>
<td>80 W</td>
</tr>
</tbody>
</table>

Note 1: With 26.5 volts ac or dc on heater.

Note 2: 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 plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 resistor adjustable between zero and 10,000 ohms, dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum, and driver power output of 3 watts.

Indicates a change.
Half-Wave Mercury-Vapor Rectifier

The 6894 is the same as the 6895 except for the following items:

Mechanical:

Overall Length: 10-3/32" ± 7/16"
Socket: Johnson No.123-211, or equivalent
Base: Skirted Medium-Metal-Shell Jumbo 4-Pin with Bayonet (JEDEC No.A4-69)

Basing Designation on BOTTOM VIEW: 4AT

Pin 1 - No Internal Connection
Pin 2 - Filament, Cathode Shield
Pin 3 - No Internal Connection
Pin 4 - Filament Cap - Anode

ZONE WHERE CONDENSED-MERCURY TEMPERATURE SHOULD BE MEASURED

CAP JEDEC No.5
T20 BULB
BASE JEDEC No. A4-69

92CM-9229R1

Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 1-63
SUPER-POWER SHIELDED GRID BEAM TRIODE

COAXIAL-ELECTRODE STRUCTURE  WATER-COOLED ELECTRODES
500-KW CW POWER OUTPUT  INTEGRAL WATER DUCTS

Useful with full input up to 75 Mc

GENERAL DATA

Electrical:
Filament, Multistrand Thoriated Tungsten:
Voltage (Single-phase AC or DC) ... 7.3 min. volts
Current at 7.3 volts. ... 1040 amp
Current at 7.8 volts. ... 1130 amp
Starting current. ... Must never exceed 1700 amperes, even momentarily
Cold resistance ... 0.0013 ohm
Minimum heating time ... 60 seconds
Amplification Factor, for dc grid
volts = -50 and dc plate voltage
adjusted to give dc plate current
of 10 amperes ... 60
Direct Inter-electrode Capacitances:
Grid to plate ... 12 μf
Grid to filament ... 1300 μf
Plate to filament ... 160 μf

Mechanical:
Operating Position ... Vertical, with lifting ring up
Maximum Overall Length ... 40"
Maximum Diameter ... 10.06"
Weight (Approx.) ... 140 lbs
Terminal Connections (See Dimensional Outline):

Air Cooling:
It is important that the temperature of any external part
of the tube should not exceed 150° C. In general, forced-
air cooling of the ceramic bushings will not be required
unless the 6949 is used in cavity-type circuits or in a
confined space without free circulation of air. Under such
conditions, provision should be made for blowing an adequate
quantity of air at the ceramic bushings to limit their
temperature to 150° C. Forced-air cooling of the output-
circuit-return terminal \( K_{R_1} \) and the flange input-circuit-return terminal \( K_{R_2} \) may be necessary to prevent exceeding the maximum temperature rating of \( 150^\circ \text{C} \), particularly at \( \text{vhf} \) frequencies.

**Water Cooling:**

Water cooling of the beam-forming cylinder, grid-terminal, and the plate is required. The water flow must start before application of any voltages and preferably should continue for several minutes after removal of all voltages. Interlocking of the water flow for each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate water flow. The use of distilled water is essential.

**Water Flow:**

<table>
<thead>
<tr>
<th>To plate (In direction shown on Dimensional Outline):</th>
<th>AbsOLUTE MIN.</th>
<th>TYPICAL</th>
<th>PRESSURE DROP for MAX.</th>
<th>GUAGE PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>For plate dissipation up to 125 kw ...</td>
<td>40</td>
<td>44</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>For plate dissipation of 260 kw ...</td>
<td>60</td>
<td>66</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>For plate dissipation of 330 kw ...</td>
<td>70</td>
<td>77</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>For plate dissipation of 400 kw ...</td>
<td>80</td>
<td>88</td>
<td>65</td>
<td>100</td>
</tr>
<tr>
<td>To grid-terminal connector ...</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To beam-forming cylinder ...</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>Outlet Water Temperature (Any outlet) ...</td>
<td>70 max.</td>
<td></td>
<td>0°C</td>
<td></td>
</tr>
<tr>
<td>Minimum Plate-Water-Column Resistance ...</td>
<td>1/2 megohm per kv of dc plate voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceramic-Bushing Temperature ...</td>
<td>150 max.</td>
<td></td>
<td>0°C</td>
<td></td>
</tr>
<tr>
<td>Metal-Surface Temperature ...</td>
<td>150 max.</td>
<td></td>
<td>0°C</td>
<td></td>
</tr>
</tbody>
</table>

**Fittings:**

Fittings for the plate and beam-forming-cylinder water connections may be obtained from the Breco Division, Perfecting Service Co., 332 Atando Ave., Charlotte 6, North Carolina, USA.
### Maximum CCS\(^*\) Ratings, Absolute Values:

For altitudes up to 5,000 feet and frequencies up to 75 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>20000 max. volts</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>60 max. amp</td>
</tr>
<tr>
<td>Max.-Signal Plate Input</td>
<td>1100000 max. watts</td>
</tr>
<tr>
<td>Max.-Signal DC Grid Current</td>
<td>1.5 max. amp</td>
</tr>
<tr>
<td>Plate Dissipation (Average)</td>
<td>4000000 max. watts</td>
</tr>
</tbody>
</table>

### Typical CCS Class B Operation at 10 Mc:

- DC Plate Voltage: 18000 volts
- DC Grid Voltage (Approx.): -300 volts
- Zero-Signal DC Plate Current: 5 amp
- Effective RF Load Resistance: 170 ohms

\(\ast\) "Single-Tone" Operation:

- Max.-Signal dc plate current: 57 amp
- Max.-Signal dc grid current: 0.35 amp
- Max.-Signal peak rf grid voltage: 1900 volts
- Max.-Signal driving power (Approx.): 100000 watts
- Max.-Signal power output (Approx.): 600000 watts

\(\ast\) "Two-Tone" Operation:

- Average dc plate current: 37 amp
- Average dc grid current: 0.22 amp
- Peak envelope rf grid voltage: 1900 volts
- Average power output (Approx.): 300000 watts
- Peak envelope power output (Approx.): 600000 watts

### RF POWER AMPLIFIER — Class C Telegraphy

### RF POWER AMPLIFIER — Class C FM Telephony

### Maximum CCS\(^*\) Ratings, Absolute Values:

For altitudes up to 5,000 feet and frequencies up to 75 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>20000 max. volts</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-1000 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 max. amp</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>1.5 max. amp</td>
</tr>
<tr>
<td>Plate Input</td>
<td>1000000 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>4000000 max. watts</td>
</tr>
</tbody>
</table>

### Typical CCS Operation at 425 Mc:

- DC Plate Voltage: 17500 volts
- DC Grid Voltage: -625 volts
- Peak RF Grid Voltage: 2000 volts
- DC Plate Current: 40 amp
- DC Grid Current: 1 amp

\*\*\#\^\@\: See next page.
SUPER-POWER SHIELDED-GRID BEAM TRIODE

Driving Power (Approx.) .......................... 2000 watts
Useful Power Output (Approx.) ....................... 5000 watts

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current</td>
<td>1</td>
<td>870</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>1.2</td>
<td>49</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Grid to filament</td>
<td>–</td>
<td>1150</td>
</tr>
<tr>
<td>Plate to filament</td>
<td>–</td>
<td>140</td>
</tr>
</tbody>
</table>

Note 1: With 7.3 volts ac on filament.
Note 2: For dc grid volts = -50 and dc plate voltage adjusted to give dc plate current of 10 amperes.

- Directly across cooled element for the indicated typical flow.
- At tube inlets.
- Continuous Commercial Service.
- Obtained from a fixed supply. Value should be adjusted to give indicated value of zero-signal plate current.
- "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.
- Includes tube losses, circuit losses, and "swamping powers" losses.
- "Two-Tone" operation refers to the simultaneous amplification of the two equal-amplitude, radio-frequency signals resulting from modulation of a single-sideband, suppressed-carrier transmitter by two audio-frequency signals of equal amplitude. The data shown for "Two-Tone" modulation refer to the case in which the peak amplitude of the resultant rf grid signal is equal to the "Max.-Signal Peak RF Grid-No.1 Voltage" as specified under "Single-Tone" modulation.
- Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.
- Additional driving power is required at frequencies where circuit losses become significant.

OPERATING CONSIDERATIONS

A high-speed, electronic protective device must be used to remove the plate voltage within a few microseconds in the event of abnormal operation such as internal arcing. The protective device employed to remove the plate voltage in any installation must be approved by the RCA Electron Tube Division. In addition, the grid circuit should be provided with overload relays which will act to remove within a period of 0.1 second all grid power in the event of excessive grid-current flow. Inquiries concerning a high-speed, electronic protective device for removal of plate voltage from the 6949 may be addressed to Commercial Engineering, Electron Tube Division, RCA, Harrison, N.J.
The 6949 can be operated with maximum ratings at frequencies up to 75 Mc and with reduced ratings to higher frequencies. The capabilities of the 6949 for operation at higher frequencies and at higher powers have not yet been determined but requests for information on specific applications will be welcomed.
6949
SUPER-POWER SHIELDED-GRID BEAM TRIODE

NOTE 1: SOCKET No.412-BS 1-1/2" FOR THIS PLUG MAY BE
OBTAINED FROM BRECO DIVISION, PERFECTING SERVICE CO.,
332 ATANDO AVE., CHARLOTTE 6, N.C.

NOTE 2: SOCKET No.4EF4 1/2" (WITH FEMALE PIPE-THREAD
CONNECTION) OR SOCKET No.4EM4 1/2" (WITH MALE PIPE-THREAD
CONNECTION) MAY BE OBTAINED FROM SUPPLIER INDICATED
IN NOTE 1.

NOTE 3: DIRECTION OF WATER FLOW THROUGH TUBE MUST BE
IN DIRECTION INDICATED BY MARKINGS AT WATER CONNECTIONS.

NOTE 4: USE FOR FILAMENT POWER ONLY. INPUT-CIRCUIT
RETURN SHOULD BE MADE TO BOTH INPUT-CIRCUIT-RETURN TERMINALS
(KR2 & KR3); OUTPUT-CIRCUIT RETURN SHOULD BE MADE TO
OUTPUT-CIRCUIT-RETURN TERMINAL (KR1).

NOTE 5: REMOVE THIS CABLE BEFORE OPERATING TUBE AND KEEP
CABLE FOR FUTURE TUBE HANDLING.

NOTE 6: DO NOT TAMPER WITH THESE BOLTS.

Notes 7 & 8: See next page.
NOTE 7: INLET WATER CONNECTIONS (IN) ARE BOTH ON SAME SIDE OF TUBE AND TO THE RIGHT WHEN TUBE IS VIEWED WITH NAME PLATE TOWARD OBSERVER.

NOTE 8: THIS AREA IS SUBJECT TO A MAXIMUM TAPER OF 0.060" TO THE INCH. THE MAXIMUM DIAMETER ALONG THIS TAPER WILL BE ON THE END TOWARD THE CERAMIC.

DETAILS OF SUGGESTED WATER-COOLED GRID-TERMINAL CONNECTOR

[Diagram showing dimensions and connections for the suggested water-cooled grid-terminal connector.]

COPPER TUBING SOLDERED IN GROOVE

VIEW AT A-A'

92CM-9294
Beam Power Tube

2 MEGAWATTS PEAK POWER OUTPUT IN SHORT-PULSE SERVICE AT 425 Mc

PULSE LENGTH TO 15 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

LIQUID COOLED

For Grid-Driven, Plate-Pulsed Amplifier Applications at Frequencies from 174 to 600 Mc

Electrical:

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

Voltage:
- Maximum, with dc or 60 cps ac excitation: 1.00 volt
- Maximum, with 400 cps ac excitation: 1.05 volts
- Typical, with dc or 60 cps ac excitation: 0.95 volt

Current:
- Typical operation value at 0.95 volt, with 60 cps excitation: 495 amp
- Minimum time to reach operating filament voltage: 30 seconds
- Minimum time at normal operating filament voltage before other voltages are applied: 90 seconds

μ-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"

Maximum Diameter: 11.25"

Weight (Approx.): 38 lbs

Terminal Connections (See Dimensional Outline):

- 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
- GIW - 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

→ Indicates a change.
### Thermal:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic-Insulator Temperature</td>
<td>150 max. °C</td>
</tr>
<tr>
<td>Metal-Surface Temperature</td>
<td>100 max. °C</td>
</tr>
<tr>
<td>Minimum Storage Temperature,</td>
<td>-65 min. °C</td>
</tr>
<tr>
<td>without cooling liquid in coolant ducts</td>
<td></td>
</tr>
<tr>
<td>External Gas Pressure</td>
<td>60 max. psia</td>
</tr>
</tbody>
</table>

### Air Cooling for Insulators and Contact Areas:

It is important that the temperature of any external part of the tube not exceed the value specified. In general, forced-air cooling of the ceramic insulators and the adjacent contact areas may be required if the tube is used in a confined space without free circulation of air. Under such conditions, provision should be made for blowing an adequate quantity of air across the ceramic insulators and adjacent terminal areas to limit their maximum temperature to the value specified.

### Liquid Cooling:

Liquid cooling of the filament block, dc cathode block, grid–No.1 block, grid–No.2 block, and plate is required. When tube operation under low ambient temperatures is required, the recommended coolant is inert liquid FC75 (Made by the Fluorochemical Division, Minnesota Mining and Manufacturing Co., 900 Bush Avenue, St. Paul 6, Minnesota) but ethylene glycol mixed with water in the proportion of 60% ethylene glycol to 40% water by weight can be used. When the environmental temperature permits, the coolant may be water; the use of distilled water or filtered deionized water is essential. The liquid flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages. Interlocking of the liquid flow through each of the cooled elements with all power supplies is recommended to prevent tube damage in case of failure of adequate liquid flow.

### Flow:

<table>
<thead>
<tr>
<th>Flow Type</th>
<th>Liquid Pressure at any outlet</th>
<th>100 max. psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow</td>
<td>Absolute Min. Flow</td>
<td>Typical Flow</td>
</tr>
<tr>
<td></td>
<td>gpm</td>
<td>gpm</td>
</tr>
<tr>
<td>Through Filament block</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Through dc cathode block</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Through grid–No.1 block</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Through grid–No.2 block</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Through plate:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For plate dissipation up to 5 kw (Av.)</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>For plate dissipation of 5kw to 8 kw (Av.)</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>

Resistivity of Water at 25°C: 1 min. megohm-cm
<table>
<thead>
<tr>
<th>Water Temperature</th>
<th>70 max. °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>See footnote d</td>
</tr>
</tbody>
</table>

**FC75 Flow:**

- **Through filament block**: 1.0 gpm, 1.2 gpm, 20 psi
- **Through dc cathode block**: 1.0 gpm, 1.2 gpm, 20 psi
- **Through grid-No.1 block**: 2.0 gpm, 1.2 gpm, 14 psi
- **Through grid-No.2 block**: 1.0 gpm, 1.2 gpm, 20 psi
- **Through plate:**
  - For plate dissipation up to 5 kW (Average): 10 gpm, 12 gpm, 20 psi
  - For plate dissipations of 5 kW to 8 kW (Average): 20 gpm, 24 gpm, 80 psi

**Outlet-Liquid FC75 Temperature from any outlet:** 70 max. °C

- **Storage Temperature with liquid FC75 in Coolant Courses:** -65 min. °C
- **Liquid FC75 Temperature for Tube Operation:** -25 min. °C

**Ethylene-Glycol-Water Solution Flow:**

- **Through filament block**: 1.0 gpm, 1.2 gpm, 18 psi
- **Through dc cathode block**: 1.0 gpm, 1.2 gpm, 18 psi
- **Through grid-No.1 block**: 1.0 gpm, 1.2 gpm, 12 psi
- **Through grid-No.2 block**: 1.0 gpm, 1.2 gpm, 18 psi
- **Through plate in direction shown on Dimensional Outline:**
  - For plate dissipation up to 5 kW (Average): 6 gpm, 8 gpm, 7 psi
  - For plate dissipations of 5 kW to 8 kW (Average): 16 gpm, 18 gpm, 40 psi

**Outlet-Solution Temperature from any outlet:** 60 max. °C

- **Min. Plate-Solution-Column Resistance at 25° C:** 10 min. megohms
- **Storage Temperature with Solution in Coolant Courses:** -45 min. °C
- **Solution Temperature for Tube Operation:** -20 min. °C

**PULSED RF AMPLIFIER**

- For frequencies from 174 to 600 Mc. and a maximum "ON" time as specified in any 3000-microsecond interval.

**Maximum Ratings, Absolute-Maximum Values:**

- **"ON" Time**: 15 µsec, 70 µsec
- **Peak Positive-Pulse Plate Voltage**: 55000 max., 30000 max. volts
**Typical Plate-Pulsed Operation:**

In Class B service at 445 Vc with a rectangular waveshape pulse.

<table>
<thead>
<tr>
<th>Duty factor</th>
<th>Pulse width</th>
<th>13 µsec</th>
<th>60 µsec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.004</td>
<td>0.018</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak Positive-Pulse</th>
<th>Plate Voltage</th>
<th>50000</th>
<th>19000</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.2 Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC or Peak Negative-Pulse</td>
<td>Grid-No.1 Voltage</td>
<td>1800</td>
<td>1700</td>
<td>volts</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>75</td>
<td>25</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>Peak Grid-No.2 Current</td>
<td>8</td>
<td>1</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>Peak Rectified</td>
<td>Grid-No.1 Current</td>
<td>10</td>
<td>0.5</td>
<td>amp</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>0.3</td>
<td>0.45</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.03</td>
<td>0.02</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.04</td>
<td>0.01</td>
<td>amp</td>
<td></td>
</tr>
<tr>
<td>Peak Driver Power</td>
<td>Output (Approx.)</td>
<td>20000</td>
<td>2000</td>
<td>watts</td>
</tr>
<tr>
<td>Useful Peak Power Output</td>
<td>20000000</td>
<td>225000</td>
<td>watts</td>
<td>watts</td>
</tr>
</tbody>
</table>

---

**Typical DC Values:**

- Peak Positive-Pulse: 2200 max. 2200 max. volts
- DC or Peak Negative-Pulse: 400 max. 400 max. volts
- Peak Plate Current: 80 max. 30 max. amp
- Peak Grid-No.2 Current: 15 max. 3 max. amp
- Peak Rectified: Grid-No.1 Current: 15 max. 3 max. amp
- DC Plate Current: 0.320 max. 0.500 max. amp
- DC Grid-No.2 Current: 0.060 max. 0.060 max. amp
- Plate Input (Average): 16000 max. 9000 max. watts
- Plate Dissipation (Average): 8000 max. 5000 max. watts

---

- **Peak Positive-Pulse** when operated near the maximum voltage value, provides emission in excess of any requirements within tube ratings, during operation of the tube, the filament voltage should be reduced to a lower level that will give adequate but not excessive emission. Careful attention to maintaining the value of filament voltage consistent with adequate emission will conserve tube life. The filament voltage should be measured at the filament liquid coolant connections on the tube side of the threads. This procedure is essential for accurate measurement of the true filament voltage. At 400 cycles some heating of the filament leads and RF cathode terminal (cathode header) occurs; this condition is not detrimental to tube operation or tube life. The cooling system must be pressurized as required to prevent corona or external arc-over. When the cooling system is to be pressurized, the method of pressurization must prevent excessive pressure in the cooling system. The cooling system must be pressurized to prevent excessive pressure in the cooling system.
- The tube coolant ducts must be free of water before storage or shipment of the tube to prevent damage from freezing. 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.

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RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
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.

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

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

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unit</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Current.</td>
<td>amp</td>
<td>460</td>
<td>530</td>
</tr>
<tr>
<td>Input Strap-Resonant Frequency.</td>
<td>Mc</td>
<td>222</td>
<td>250</td>
</tr>
<tr>
<td>Output Strap-Resonant Frequency.</td>
<td>Mc</td>
<td>230</td>
<td>250</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate.</td>
<td>pf</td>
<td>-</td>
<td>0.15</td>
</tr>
<tr>
<td>Grid No.2 to cathode.</td>
<td></td>
<td>10000</td>
<td>18000</td>
</tr>
</tbody>
</table>

- At filament voltage of 0.95 volt and ac filament excitation at 60 cps.
- The frequency range of the sweep generator is varied to produce the resonance curve observed on the oscilloscope and the UHF Marker Oscillator frequency is varied so that the pip is observed at the peak of the resonance curve. The resonant frequency is read on the frequency meter.
- Measured with special shield adapter.

### COOLING CONSIDERATIONS

**System**

The liquid—cooling system consists, in general, of a source of cooling liquid, a liquid regeneration loop, a heat exchanger, a feed-pipe system which carries the liquid to the filament section blocks, to the filament common—point connection, to the grid-No.1 block, to the grid-No.2 block, and to the plate connections of the tube, and provision for interlocking the liquid flow through each of the cooling courses with the power supplies.

It is essential that the insulating tubing between the cooling-system piping and each of the cooling courses have good insulating qualities and be of sufficient length to minimize leakage currents and/or electrolysis effects. The minimum plate liquid column resistance should be 10 megohms at 25°C.

The piping system must be arranged so that direction of coolant flow through the plate coolant connection is in accord with the markings on the plate coolant connection (see Dimensional Outline) to insure adequate cooling. Through each of the other coolant connections, the liquid flow may be in either direction. Series or parallel arrangement of the coolant ducts is permissible so long as the specified flow, pressure, and outlet temperature ratings are observed. Caution: The feed-pipe system should be so designed that all of the cooling liquid indicated by the flow meter at each outlet passes through the associated coolant duct within the tube, and is not shunted inadvertently by any other path.
A test as to proper design and functioning of the feed-pipe system can be made by plugging the inlet and outlet holes of the fitting at each cooling connection.

Under these conditions, and with all voltages removed from the tube, no liquid flow should be indicated by the flowmeter for any connection when the coolant valve is fully opened.

**Precautions**

Proper functioning of the coolant system is of the utmost importance. Even a momentary failure of the liquid flow will damage the tube. In fact, without coolant, the heat of the filament alone is sufficient to cause serious harm. It is, therefore, necessary to provide a method of preventing operation of the tube in case the coolant supply should fail. This may be done by the use of coolant-flow interlocks which open the power supplies when the flow through any element is insufficient or ceases. The coolant flow must start before application of any voltages and preferably should continue for several seconds after removal of all voltages.

The absolute minimum coolant flow required through the filament section blocks, the filament common-point connections, the grid-No.1 block the grid-No.2 block, and to the plate together with pressure differentials across the cooled elements, is given in the tabulated data. The use of an outlet coolant thermometer and a coolant flow meter at each of the outlets is recommended. Under no circumstances should the temperature of the coolant from any outlet ever exceed the maximum value given for the coolant in the tabulated data.

In spite of the usual precautions taken to eliminate contamination of the coolant by oil, dust, etc., some impurities are likely to enter the fluid. The use of a strainer with at least 60-mesh screen is recommended in the coolant supply line as near to the tube as possible to trap any foreign particles likely to impair the coolant flow through the tube ducts. Also, a regeneration loop followed by a submicron filter should be employed. For example, a regeneration loop having a 10-to-20-gallon-per-hour capacity will ordinarily be adequate for use with a cooling system containing about 20 gallons.

When the tube is used in equipment under conditions such that the ambient temperature is below 0°C, precautions should be taken to prevent freezing of the water in the tube ducts.

FOR ADDITIONAL INFORMATION ON THIS TYPE INCLUDING INPUT AND OUTPUT CAVITY DRAWINGS, WRITE FOR TECHNICAL BULLETIN AVAILABLE FROM:

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey
A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

\[ E_F = 0.95 \text{ VOLT} \]
\[ I_{C1} = \text{GRID-N}\#1 \text{ AMPERES} \]
\[ I_{C2} = \text{GRID-N}\#2 \text{ AMPERES} \]
\[ \text{GRID-N}\#2 \text{ VOLTS} = 1800 \]
MAGNETRON
SERVO-TUNABLE TYPE
INTEGRAL MAGNET
For use as a pulsed oscillator
at frequencies between 8500 and 9600 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
Voltage: 13.75 ± 10% ac or dc volts
Current at 13.75 volts: 3.15 amp
Starting current: The maximum instantaneous starting current must never exceed 12 amperes, even momentarily.
Minimum Cathode Heating Time: 2.5 minutes
Frequency: 8500 to 9600 Mc
Maximum Frequency Pulling at:
VSWR of 1.5: 15 Mc

Mechanical:

Operating Position: Any
Dimensions: See Dimensional Outline

Air Flow:

Through Ducts—An air stream should be directed through each of the cooling ducts provided on the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150°C.

To Heater-Cathode Terminal—Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165°C.

Waveguide Output Flange: Mates with Modified JAN UG-52A/U Flange

Servo-Drive Shaft with Associated Calibrated Indicator:
Revolutions (Approx.) to cover full range of 8500 to 9600 Mc: 160
Maximum Torque (Absolute) at tuning-range stops: 192 oz-in.
Typical Torque between -55° and +150° C (Approx.): 6 oz-in.
Weight (Approx.): 13 lbs

PULSED-OSCILLATOR SERVICE

Maximum and Minimum Ratings, Absolute Values:
For duty cycle up to 0.0011 maximum

PEAK ANODE VOLTAGE: 23 max. kv
PEAK ANODE CURRENT: 27.5 max. amp
PEAK POWER INPUT*: 630 max. kw
AVERAGE POWER INPUT: 0.63 max. kw
PULSE DURATION: 2.75 max. μsec

*: See next page.
MAGNETRON

RATE OF RISE OF VOLTAGE PULSE:
For pulse duration of
1 µsec or less .................. \{225 max. kv/µsec
70 min. kv/µsec
For pulse duration greater
than 1 µsec. .................. \{200 max. kv/µsec
70 min. kv/µsec

ANODE-BLOCK TEMPERATURE ........ 150 max. °C
HEATER-CATHODE-TERMINAL TEMPERATURE .... 165 max. °C
LOAD-VOLTAGE STANDING-WAVE RATIO ...... 1.5 max.

Typical Operation# with Load-Voltage Standing-Wave Ratio
Equal to or Less than 1.05, Except as Noted:
With duty cycle of 0.001

Heater Voltage .................. See Operating Considerations
Peak Anode Voltage .............. 22 22 kv
Peak Anode Current ............. 27.5 27.5 amp
Pulse-Repetition Rate .......... 400 4000 cps
Pulse Duration .................. 2.5 0.25 µsec
RF Bandwidth with worst
phasing of 1.5 VSWR ............ 0.5 5 Mc
Side Lobes with worst phasing
of 1.5 VSWR .................. 8 10 db
Pulling Figure at VSWR of 1.5 .. 10 10 Mc
Pushing Figure .................. 0.2 0.2 Mc/amp
Typical Operation# with Load-Voltage Standing-Wave Ratio
Equal to or Less than 1.05, Except as Noted:
With duty cycle of 0.001

Peak Power Output (Approx.) .... 220 220 kw

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>2.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Peak Anode Voltage</td>
<td>2</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Peak Power Output</td>
<td>3</td>
<td>180</td>
<td>-</td>
</tr>
<tr>
<td>Pulses Missing from Total</td>
<td>4,5</td>
<td>0.25</td>
<td>%</td>
</tr>
</tbody>
</table>

Notes 1 to 5: See next page.
MAGNETRON

Note 1: With 13.75 volts ac or dc on heater.
Note 2: With peak anode current of 27.5 amperes. For heater voltage, see Operating Considerations.
Note 3: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 2.5 microseconds, and maximum load-voltage standing-wave ratio equal to or less than 1.05. For heater voltage, see Operating Considerations.
Note 4: Pulses are considered to be missing if the energy level at the operating frequency is less than 70 per cent of the normal value.
Note 5: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 0.25 microsecond, load-voltage standing-wave ratio of 1.5 adjusted in phase to produce maximum instability. For heater voltage, see Operating Considerations.

DEFINITIONS

Smooth Peak Value. The maximum value of a smooth curve drawn through the average of the fluctuation over the top of a voltage or current pulse.

Pulse Width. The time interval between the two points of the current pulse at which the current is 50 per cent of the smooth peak value.

Rate of Rise of Voltage Pulse. The steepest slope of the voltage-pulse leading edge above 50 per cent of the smooth peak value. Measurement of the rate of rise of voltage should be made using a capacitance divider with an input capacitance not exceeding 4 µF. An oscilloscope of sufficient bandpass, such as the Tektronix 517 or equivalent, should be used.

OPERATING CONSIDERATIONS

Mounting of the 7008 should be accomplished by means of the mounting flange which may be positioned to operate the tube in any orientation. This flange is made to permit use of the 7008 in applications requiring a pressure seal. Care should be taken by the equipment designer to insure that the tube is mounted on a surface having adequate flatness so as to avoid possible distortion of the mounting flange when it is bolted to the mounting surface. Captive 1/4" - 20 bolts are provided at the corners of the mounting flange for mounting the magnetron. These four mounting bolts are held in position during shipment of the 7008 by plastic sleeving which also serves to protect the bolt threads.

Fastening the JAN RG-51/U waveguide to the waveguide output flange of the tube is accomplished in the following manner. A JAN UG-52AU/U choke flange or equivalent should be modified by drilling out the screw threads from the four mounting holes in the choke flange using a No.15 drill. This operation will permit four size 8-32 bolts inserted through the flange mounting holes, to engage the threaded waveguide output flange of the tube. It is recommended that the choke flange be sufficiently tight to avoid arcing and other contact effects. Before the choke flange is fastened to the waveguide output flange of the tube, the user should make certain that the waveguide window is entirely free of dust to prevent possible arcing with consequent damage to the tube.
A conduit should be attached to each of the inlet-air duct flanges provided on the tube. The conduits should be made of flexible, non-magnetic material. Rubber hose or stainless-steel hose is suitable. Fastening of the conduits requires two non-magnetic 6-32 screws at each duct. Adequate flow of cooling air should be provided through the ducts to maintain the temperature of the anode block below 150° C under any condition of operation. Failure to provide adequate cooling will impair tube life. Cooling of the heater-cathode terminal may be required under some conditions to maintain the temperature of this terminal below 165° C.

A mechanical drive may be connected to the drive shaft of the 7008 by using a flexible coupling drilled for a 3/16"-diameter shaft and held in place by a setscrew. When the magnetron is installed in radar equipment which has a frequency index dependent upon rotation of the drive shaft, both the index and the 7008 tuner indicator should be adjusted to the same frequency before the drive coupling is connected to the drive shaft.

The heater terminal and the heater-cathode terminal require the use of a connector with flexible leads such as the Ucinite® No. 115364 with built-in capacitor, or equivalent. Unless flexible leads are used, the heater and heater-cathode seals may be damaged.

A heater starter should be used to raise the voltage gradually and to limit the instantaneous starting current through the heater when the circuit is first closed. The starter may be either a system of time-delay relays cutting resistance out of the circuit, a high-reactance heater transformer, or a simple rheostat. Regardless of the method of control, it is important that the maximum instantaneous starting current never exceed, even momentarily, a value of 12 amperes. Exceeding this value may damage the heater.

After the heater voltage is raised to its rated value of 13.75 volts, allow the cathode to warm up for at least 2-1/2 minutes to make sure that the cathode reaches operating temperature. When the cathode has reached full operating temperature, high-voltage pulses, negative with respect to anode (ground), can be applied to the heater-cathode terminal. As soon as the 7008 begins to oscillate, the heater voltage (Ef) should be reduced in accordance with the following formulas, depending on the average power input (Pi) to the tube:

\[ Ef = 13.75 \left(1 - \frac{P_i}{450}\right) \text{ volts} \]

\[ Ef = 0 \text{ volts} \]

When the 7008 is oscillating, the cathode is subjected to considerable electron bombardment which raises the temperature of the cathode. The magnitude of such heating is a

* Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newsonville 60, Massachusetts.
function of the total dissipation and must be compensated by reduction of heater voltage in order to prevent overheating of the cathode. Failure to start the tube at rated heater voltage and to reduce the heater voltage as soon as oscillation starts may adversely affect tube life.

The heater should be protected against input pulse power by placing a suitable capacitor in shunt with the heater leads as near the heater-cathode stem as possible in order to limit the magnitude of the transient voltages which may develop across the heater. This capacitor may be incorporated in the design of the connector for the heater terminal and heater-cathode terminal.

The anode-circuit return should be made to the heater-cathode terminal. If the anode-circuit return is made to the heater terminal, all of the anode current will flow through the heater and may cause heater burnout.

The frequency of the 7008 may be preset by turning the drive shaft until the setting of the indicator is reached corresponding to the desired frequency. For precise tuning adjustment, the final indicator setting should be approached using a counterclockwise direction of rotation which is the direction of increasing frequency.

Revolutions of the servo-drive shaft are not indicated directly by the indicator. Approximately 160 revolutions of the drive shaft are required to tune through the 8500-to-9600-Mc range. A tuning rate of 200 megacycles per second can be achieved. Typical servo-drive-shaft torque is 6 ounce-inches throughout the temperature range of -55° to 150° C. Mechanical stops are provided at each end of the tuning range. Torque applied to these stops and the starting torque must not exceed 192 ounce-inches (1 foot-pound) including inertial effects.

Our engineers are ready to assist you in circuit applications of the RCA-7008. For further information, write to Commercial Engineering, RCA, Harrison, New Jersey, giving complete details as to the proposed service.
FREQUENCY (Mc) = 8500
PEAK ANODE AMPERES = 27.5
PULSE DURATION (µSEC) = 2.5
PULSE-REPETITION RATE (PPS) = 400

PHASE OF LOAD MEASURED IN FRACTIONS OF GUIDE WAVELENGTH

CIRCLES OF CONSTANT LOAD REFLECTION COEFFICIENT (VSWR)

SINK (REGION OF INSTABILITY)

LINES OF CONSTANT FREQUENCY

LINES OF CONSTANT PEAK POWER OUTPUT

92CM-9629
**TYPICAL STABILIZATION CHARACTERISTIC**

- **Anode Kilovolts (Approx.)**: 22
- **Peak Anode Amperes**: 27.5
- **Pulse Duration (μsec)**: 1
- **Pulse-Repetition Rate (PPS)**: 1000
- **Cathode Warm-Up Time (Minutes)**: 2.5
- **Ambient Temperature (°C Approx.)**: 25

**TYPICAL COOLING REQUIREMENTS**

With duct arrangement described under operating considerations. Ambient temperature (°C Approx.) = 25

**Diagram**

- **Total Flow of Air at Ambient Temperature - CFM**
  - **Average Anode MA, I=27.5**:
    - 25
    - 22.5
    - 20
    - 17.5

Electron Tube Division
Radio Corporation of America, Harrison, New Jersey
**MAGNETRON**

**DETAIL A**

Heater terminal

Heater-cathode terminal

Max. (Note 6)

Min. (Note 6)

1.5" MAX

.516" .556" MAX.

.516" .556" MIN.

.540" +.005" -.008

.610" -.750"

1.25" ± .010" (Note 7)

1.69" ± .005

1.250" ± .015"

.830" ± .008" -.005"

SEE NOTE 8

**DETAIL B**

11.00 ± 1.00

11.00  32 ± 32

1.00  32 ± 32

11.00 ± 1.00

.550" +.007" -.032" ± .007"

.550" -.032" .007"

3.00  64 ± 1.00

1.00  4 ± .64

6-32 NC-2TH'D 2 HOLES

92CS-9486

SEE NOTE - .005

92CS-896IRI

ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-8961R1

9-58
REFERENCE PLANE A IS DEFINED AS THE PLANE THROUGH THAT PORTION OF THE MOUNTING FLANGE DESIGNATED AS ANNULAR SURFACE D.

REFERENCE PLANE B IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A AND PASSES THROUGH THE EXACT CENTERS OF MOUNTING-FLANGE HOLES No. 2 & No. 3 WHICH HAVE THE SPECIFIED BOLTS INSERTED THROUGH THEM.

REFERENCE PLANE C IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A & PLANE B AND PASSES THROUGH THE EXACT CENTER OF MOUNTING-FLANGE HOLES No. 3 & No. 4 WHICH HAVE THE SPECIFIED BOLTS INSERTED THROUGH THEM.

NOTE 1: SURFACE E OF THE WAVEGUIDE OUTPUT FLANGE, AND THE ENTIRE MOUNTING FLANGE ARE MADE SO THAT THEY MAY BE USED TO PROVIDE A HERMETIC SEAL.

NOTE 2: THE AXIS OF THE HEATER-CATHODE TERMINAL WILL BE WITHIN THE CONFINES OF A CYLINDER WHOSE RADIUS IS 3/64" AND WHOSE AXIS IS PERPENDICULAR TO REFERENCE PLANE A AT THE SPECIFIED LOCATION.

NOTE 3: ALL POINTS ON MOUNTING FLANGE WILL LIE WITHIN 0.015" ABOVE OR BELOW REFERENCE PLANE A.

NOTE 4: THE LIMITS INCLUDE ANNULAR AS WELL AS LATERAL DEVIATIONS.

NOTE 5: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.169" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER TERMINAL.

NOTE 6: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.540" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER-CATHODE TERMINAL.

NOTE 7: NO PART OF THE CONNECTOR DEVICE FOR THE HEATER AND HEATER-CATHODE TERMINALS SHOULD BEAR AGAINST THE UNDERSIDE OF THIS LIP.

NOTE 8: THE HEATER TERMINAL AND THE HEATER-CATHODE TERMINAL ARE CONCENTRIC WITH 0.010".

NOTE 9: CLOCKWISE ROTATION OF DRIVE SHAFT DECREASES FREQUENCY.

NOTE 10: ANODE TEMPERATURE MEASURED AT JUNCTION OF WAVEGUIDE AND ANODE BLOCK.

NOTE 11: TEMPERATURE OF HEATER-CATHODE TERMINAL MEASURED HERE.
Typical Thermal Factor Characteristic
TYPICAL PERFORMANCE CURVES

OPERATING FREQUENCY (Mc) = 9000
PULSE DURATION (μ SEC ) = 2.5
PULSE-REPETITION RATE (PPS) = 400
LOAD VSWR = 1.05
TYPICAL PERFORMANCE CURVES

PEAK ANODE AMPERES = 27.5
PULSE DURATION (μSEC) = 2.5

PEAK POWER OUTPUT

PEAK ANODE VOLTAGE

FREQUENCY—Mc

REPRESENTATIVE TUNING CHARACTERISTIC

INDICATOR SETTING

FREQUENCY—Mc

92CS-9466
ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
Beam Power Tube

FORCED-AIR COOLED
COAXIAL-ELECTRODE STRUCTURE 370 WATTS CW OUTPUT UP TO 150 Mc
UNIPOTENTIAL CATHODE 140 WATTS CW OUTPUT AT 500 Mc
COMPACT DESIGN INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

The 7035/4X150D is the same as the 7034/4X150A except for the following items:

Heater, for Unipotential Cathode:
Voltage (AC or DC)\(^a\) .................. 26.5 ± 10% volts
Current at heater volts = 26.5 .................. 0.58 amp

\(^a\) Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td>1</td>
<td>0.50</td>
<td>0.62</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate.</td>
<td>2</td>
<td>-</td>
<td>0.05</td>
</tr>
<tr>
<td>Grid No.1 to cathode, grid No.2, and heater.</td>
<td>2</td>
<td>14.5</td>
<td>17.0</td>
</tr>
<tr>
<td>Plate to cathode, grid No.2, and heater.</td>
<td>2</td>
<td>4.0</td>
<td>4.8</td>
</tr>
<tr>
<td>Grid-No.1 Voltage</td>
<td>1, 3, 4, 5</td>
<td>-32</td>
<td>-46</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>1, 3, 4, 5</td>
<td>-5</td>
<td>3</td>
</tr>
<tr>
<td>Power Output.</td>
<td>4, 5, 6</td>
<td>100</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: With 26.5 volts on heater.

Note 2: With cylindrical shield having inside diameter of 1-13/16" completely surrounding radiator, and insulated from the top and sides of it by a 1/16" thickness of insulating material; and with a cylindrical shield having inside diameter of 1.460" and length of 5/16" surrounding the grid-No.2 ring terminal and insulated from it. Both shields are connected to ground.

Note 3: With plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 milliamperes.

Note 4: With forced-air cooling as specified under GENERAL DATA for 4X150 Socket.

Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.

Note 6: With heater volts = 24.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 milliamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of 475 Mc.

SPECIAL PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions: ac heater volts = 29.1, no voltage on other elements, \(\leftrightarrow\) indicates a change.
and specified forced-air cooling for Air-System Socket. At the end of 500 hours, with tube at 25° C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

- Grid No.1 and grid No.2 ............... 10 min. megohms
- Grid No.1 and cathode ................. 10 min. megohms
- Grid No.2 and cathode ................. 10 min. megohms
The 7035/4X150D is the same as the 7034/4X150A except for the following items:

Heater, for Unipotential Cathode:
- Voltage: 26.5 ± 10% ac or dc volts
- Current at 26.5 volts: 0.58 amp

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

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<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.50</td>
<td>0.62</td>
</tr>
</tbody>
</table>

### Direct Interelectrode Capacitances:

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to plate</td>
<td>0.05 μf</td>
</tr>
<tr>
<td>Grid No.1 to cathode, grid No.2, and heater</td>
<td>14.5 μf</td>
</tr>
<tr>
<td>Plate to cathode, grid No.2, and heater</td>
<td>4.8 μf</td>
</tr>
<tr>
<td>Grid-No.1 Voltage</td>
<td>1,3,4,5 -34 -46 volts</td>
</tr>
<tr>
<td>Grid-No.2 Current</td>
<td>1,3,4,5 -5 3 mA</td>
</tr>
<tr>
<td>Mu-Factor, Grid No.2 to Grid No.1</td>
<td>1,4,5,6 -4 -6</td>
</tr>
<tr>
<td>Power Output</td>
<td>4.5,7 100 - watts</td>
</tr>
</tbody>
</table>

**Note 1:** With 26.5 volts on heater.

**Note 2:** With cylindrical shield having inside diameter of 1-13/16" completely surrounding radiator, and insulated from the top and sides of it by a 1/16" thickness of insulating material; and with a cylindrical shield having inside diameter of 1.460" and length of 5/16" surrounding the grid-No.2 ring terminal and insulated from it. Both shields are connected to ground.

**Note 3:** With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 milliamperes.

**Note 4:** With forced-air cooling as specified under GENERAL DATA for Air-System Socket for type 7034/4X150A.

**Note 5:** Heater voltage must be applied for at least 30 seconds before application of other voltages.

**Note 6:** With dc grid-No.2 volts = 300 and grid-No.2 milliamperes = 50.

**Note 7:** With heater volts = 24.5, dc plate volts = 1000, dc grid-No.2 volts = 250, dc grid-No.1 volts = -90, maximum dc grid-No.1 milliamperes = 20, grid-No.1 signal voltage adjusted to give dc plate current of 200 milliamperes, and a frequency of 475 Mc.

Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

### SPECIAL PERFORMANCE DATA

#### Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions:
- ac heater volts = 29.1, no voltage on other elements, and specified forced-air cooling for Air-System Socket. At the
end of 500 hours, with tube at 25°C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

<table>
<thead>
<tr>
<th>Electrode Combination</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 and grid No.2</td>
<td>10 min. megohms</td>
</tr>
<tr>
<td>Grid No.1 and cathode</td>
<td>10 min. megohms</td>
</tr>
<tr>
<td>Grid No.2 and cathode</td>
<td>10 min. megohms</td>
</tr>
</tbody>
</table>
Beam Power Tube

FORCED-AIR COOLED AT MAXIMUM RATINGS
500 WATTS CW INPUT (ICAS) UP TO 60 Mc
335 WATTS CW INPUT (ICAS) UP TO 175 Mc

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) ..................... 6.3 \pm 10\% volts
Current at 6.3 volts ................... 2.85 amp
Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 300, grid-No.2 volts = 300, and plate ma = 150. ........... 7
Direct Interelectrode Capacitances (Approx.):
Grid No.1 to plate ..................... 0.6 \mu f
Grid No.1 to grid No.2 & internal shield ..................... 11 \mu f
Grid No.1 to cathode and heater ..................... 8.5 \mu f
Grid No.2 & internal shield to plate ..................... 9.5 \mu f
Grid No.2 & internal shield to cathode and heater ..................... 2.0 \mu f
Plate to cathode and heater ..................... 0.2 \mu f

Mechanical:
Operating Position ..................... Any
Maximum Overall Length ..................... 5"
Seated Length ........................ 4.44" \pm 0.08"
Maximum Diameter ..................... 2.56"
Weight (Approx.) ..................... 6 oz
Bulb ..................... T20 (JEDEC No.E7-46)
Socket ..................... Johnson Nos.122-247 or 122-248, or equivalent
Base ..................... Jumbo-Button Septar 7-Pin (JEDEC No.E7-46)

Bottom View

Pin 1 - Heater
Pin 2 - Heater
Pin 3 - Grid No.2, Internal Shield
Pin 4 - Cathode
Pin 5 - Grid No.2, Internal Shield
Pin 6 - Grid No.1
Pin 7 - Grid No.2, Internal Shield
P - Plate

Thermal:
Cooling—Free circulation of air around the tube is required. Under operating conditions at maximum ratings, some forced-air cooling will be required from a small fan to prevent exceeding the specified maximum bulb temperature.
Bulb Temperature (At hottest point on bulb surface) ..................... 250 max. \degree C

\( \Rightarrow \) Indicates a change.
# AF Power Amplifier & Modulator — Class AB{

**Maximum Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>1500 max.</th>
<th>2000 max.</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max.</td>
<td>400 max.</td>
<td>volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td>350 max.</td>
<td>350 max.</td>
<td>ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td>200 max.</td>
<td>200 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>100 max.</td>
<td>125 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
<td>volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
<td>volts</td>
</tr>
</tbody>
</table>

**Typical Operation:**

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>1500</th>
<th>2000</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400</td>
<td>400</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-65</td>
<td>-65</td>
<td>volts</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>120</td>
<td>120</td>
<td>volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>60</td>
<td>60</td>
<td>ma</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>400</td>
<td>400</td>
<td>ma</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current</td>
<td>70</td>
<td>70</td>
<td>ma</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>8700</td>
<td>12000</td>
<td>ohms</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0</td>
<td>0</td>
<td>watts</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>410</td>
<td>560</td>
<td>watts</td>
</tr>
</tbody>
</table>

---

# Linear RF Power Amplifier — Class AB{

**Maximum Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>1500 max.</th>
<th>2000 max.</th>
<th>volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max.</td>
<td>400 max.</td>
<td>volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td>350 max.</td>
<td>350 max.</td>
<td>ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td>200 max.</td>
<td>200 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>100 max.</td>
<td>125 max.</td>
<td>watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
<td>volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
<td>volts</td>
</tr>
</tbody>
</table>

---

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Typical Operation for "Single-Tone Modulation":^i

**At 60 Mc**

- **DC Plate Voltage**... 1500 2000 volts
- **DC Grid-No.2 Voltage**... 400 400 volts
- **DC Grid-No.1 Voltage**... -65 -65 volts
- **Max.-Signal Peak RF Grid-No.1 Voltage**... 60 60 volts
- **Zero-Signal DC Plate Current**... 30 30 ma
- **Max.-Signal DC Plate Current**... 200 200 ma
- **Max.-Signal Grid-No.2 Current**... 35 35 ma
- **Effective RF Load Resistance**... 4350 6000 ohms
- **Max.-Signal Driver Power Output (Approx.)**... 4 4 watts
- **Output-Circuit Efficiency (Approx.)**... 90 90 %
- **Max.-Signal Useful Power Output (Approx.)**... 185k 250k watts

**LINEAR RF POWER AMPLIFIER — Class B**

**Single-Sideband Suppressed-Carrier Service**

**High-Mu Triode Connection**

**Maximum Ratings, Absolute-Maximum Values:**

**Up to 60 Mc**

- **DC PLATE VOLTAGE**... 1500 max. 2000 max. volts
- **MAX. SIGNAL DC PLATE CURRENT**... 350 max. 350 max. ma
- **MAX.-SIGNAL DC GRID CURRENT** (Combined Grids No.1 & No.2)... 200 max. 200 max. ma
- **MAX.-SIGNAL PLATE INPUT**... 300 max. 450 max. watts
- **PLATE DISSIPATION**... 100 max. 125 max. watts
- **PEAK HEATER-CATHODE VOLTAGE:**
  - Heater negative with respect to cathode... 135 max. 135 max. volts
  - Heater positive with respect to cathode... 135 max. 135 max. volts

**Typical Operation:**

**In cathode-drive circuit at 60 Mc with "Single-Tone Modulation"**

- **DC Plate-to-Grids No.1 & No.2 Voltage**... 1350 1750 volts
- **DC Grids No.1 & No.2 Voltage**... 0 0 volts
- **Zero-Signal DC Plate Current**... 30 44 ma
- **Effective RF Load Resistance**... 3800 5100 ohms
- **Max.-Signal DC Plate Current**... 200 200 ma

^i Indicates a change.

---

RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.
Max.-Signal DC Grid Current (Combined Grids No.1 & No.2). | 140 | 140 | ma
Max.-Signal Peak RF Cathode-to-Grids-No.1 & No.2 Voltage. | 50 | 50 | volts
Max.-Signal Driver Power Output (Approx.) | 15 | 15 | watts
Output-Circuit Efficiency (Approx.) | 90 | 90 | %
Max.-Signal Useful Power Output (Approx.) | 160 \( \text{h} \) | 210 \( \text{k} \) | watts

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1000 max. 1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max. 400 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-300 max. -300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>280 max. 280 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>25 max. 30 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>250 max. 335 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>13.5 max. 13.5 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>67 max. 83 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>135 max. 135 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>135 max. 135 max. volts</td>
</tr>
</tbody>
</table>

Typical Operation:

At 60 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 1200 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage( p )</td>
<td>400 400 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage( p )</td>
<td>-130 -130 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>145 150 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250 275 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>20 20 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>5 5 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.) ( p )</td>
<td>5 5 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 90 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>165 ( \text{h} ) 240 ( \text{k} ) watts</td>
</tr>
</tbody>
</table>

At 175 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>700 820 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage( p )</td>
<td>400 400 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage( p )</td>
<td>-130 -130 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250 275 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>8 8 ma</td>
</tr>
<tr>
<td>Parameter</td>
<td>Value</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>6 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>8 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency</td>
<td>85%</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>105 watts</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values:**
- Grid-No.1 Circuit Resistance: 30,000 max. ohms

**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy**

**RF POWER AMPLIFIER — Class C FM Telephony**

**Maximum Ratings, Absolute-Maximum Values:**

For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1250 max. 1500 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. 400 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-300 max. -300 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>340 max. 340 max. ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>25 max. 30 max. ma</td>
</tr>
<tr>
<td>Plate Input</td>
<td>375 max. 500 max. watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>20 max. 20 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>100 max. 125 max. watts</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage:</td>
<td>135 max. 135 max. volts</td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td></td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td></td>
</tr>
</tbody>
</table>

**Typical Operation:**

**At 60 Mc**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 1250 1500 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 400 400 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 -100 -100 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>125 120 125 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>330 300 330 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>20 18 20 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>5 5 5 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>4 4 4 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency</td>
<td>90 90 90 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>215 255 340 watts</td>
</tr>
</tbody>
</table>

**At 175 Mc**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>665 875 1000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 400 400 volts</td>
</tr>
</tbody>
</table>
Output-Circuit

DC

Useful

7094

Power Output

(Res.)

335

8

335

8

ma

ma

watts

watts

Maximum Circuit Values:

Grid-No.1-Circuit

Resistance

30000 max. ohms

Without external shield.

E.F. Johnson Company, Waseca, Minnesota. The separate shield rings furnished with these sockets should be discarded since these rings do not accommodate the 7094.

Subscript J indicates that grid-No.1 current does not flow during any part of the input cycle.

Continuous Commercial Service.

Intermittent Commercial and Amateur Service.

Averaged over any audio-frequency cycle of sine-wave form.

Obtained preferably from a fixed supply.

Obtained from a fixed supply.

"Single-Tone Modulation" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-side-band suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

This value of useful power is measured at load of output circuit having indicated efficiency.

Grids No.1 and No.2 connected together.

Driver stage is required to supply tube losses and rf circuit losses. The driver stage should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

Obtained preferably from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor. The combination of grid resistor and fixed supply has the advantage of not only protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

Indicated values are for operation at 60 Mc. Less driver power output is required at frequencies below 60 Mc.

When grid-No.1 is driven positive the total dc grid-No.1-circuit resistance should not exceed the specified maximum value of 30000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply. Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

Obtained preferably from a separate source or from the plate-voltage supply with voltage divider. If a series resistor is used, it should be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed. Grid-No.2 voltage must not exceed 500 volts under key-up conditions.

Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
THE REFERENCE AXIS Y—Y' IS DEFINED AS THE AXIS OF THE BASE PIN GAUGE DESCRIBED IN NOTE 1:

NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN—CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT—PLATE BASE—PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.0005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" DIAMETER CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ± 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS Y—Y'.

NOTE 2: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.
RATING CHART I
Class C Telephony Service

RATING CHART II
Class C Telegraphy Service
TYPICAL PLATE CHARACTERISTICS

\[ E_f = 6.3 \text{ VOLTS} \]
\[ \text{GRID-N\#2 VOLTS} = 300 \]
TYPICAL PLATE CHARACTERISTICS

E₂ = 6.3 VOLTS
GRID-No.2 VOLTS = 400

PLATE AMPERES

PLATE VOLTS
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_F = 6.3 \text{ Volts}$

GRID-NO.2 VOLTS = 400

$I_b = \text{PLATE AMPERES}$

$I_{C1} = \text{GRID-NO.1 AMPERES}$

$I_{C2} = \text{GRID-NO.2 AMPERES}$

GRID-NO.1 VOLTS

GRID-NO.2 VOLTS

PLATE VOLTS

92CM-9512

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

$E_f = 6.3\ \text{VOLTS}$
$\text{GRID-\#2 VOLTS} = 300$
$\text{GRID-\#1 VOLTS} = E_C$

---

$E_f = 6.3\ \text{VOLTS}$
$\text{GRID-\#2 VOLTS} = 400$
$\text{GRID-\#1 VOLTS} = E_C$

---

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS
Triode Connection

E_g = 6.3 VOLTS
GRID No.2 CONNECTED TO GRID No.1.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS
Triode Connection

$E_g = 6.3$ VOLTS
GRID No.2 CONNECTED TO GRID No.1.
$I_b =$ PLATE AMPERES
$I_{C1} =$ GRID-No.1 AMPERES

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 8
5-62
TYPICAL CHARACTERISTICS
Triode Connection

E₀=6.3 VOLTS
GRID No.2 CONNECTED TO GRID No.1
E₀=GRID-No.1 VOLTS

GRID - No.1 AMPERES

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Magnetron

TUNABLE TYPE

INTEGRAL MAGNET

For Forced-Air Cooled Applications

For Pulsed-Oscillator Applications at Frequencies between 8500 and 9600 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
- Voltage (AC or DC): 13.75 ± 10% volts
- Current at heater volts = 13.75: 3.15 amp
- Starting current: Must never exceed 12 amperes, even momentarily

Minimum Cathode Heating Time: 2.5 minutes

Frequency: 8500 to 9600 Mc

Maximum Frequency Pulling at VSWR of 1.5: 15 Mc

Mechanical:

Operating Position: Any

Dimensions: See Dimensional Outline

Air Flow:
- To Fins: An air stream should be directed along the cooling fins toward the body of the tube. Adequate flow should be provided so that the temperature of the anode block does not exceed 150° C.
- To Heater-Cathode Terminal: Adequate flow should be provided to maintain the temperature of the heater-cathode terminal below 165° C.

Waveguide Output Flange: Mates with Modified JAN UG-52A/U Flange

Heater & Heater-Cathode Connector with built-in capacitor: Jettron No.9000-C, or Ucinite No.115364

Tuning Shaft with Associated Calibrated Indicator:
- Revolutions (Approx.) to cover full range of 8500 to 9600 Mc: 8-1/2
- Maximum torque (Absolute) at tuning-range stops: 200 oz-in.
- Typical torque between -55° and +150° C (Approx.): 50 oz-in.
- Weight (Approx.): 12 lbs

PULSED OSCILLATOR

Maximum and Minimum Ratings, Absolute-Maximum Values:

For duty factor up to 0.0011 maximum

PEAK ANODE VOLTAGE: 23 max. kw
PEAK ANODE CURRENT: 27.5 max. amp
PEAK POWER INPUT: 630 max. kw
AVERAGE POWER INPUT: 0.63 max. kw
PULSE DURATION: 2.6 max. µsec

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Electron Tube Division
Harrison, N. J.

DATA 1
9-62
ANODE-BLOCK TEMPERATURE: 150 max. °C
HEATER-CATHODE-TERMINAL TEMPERATURE: 165 max. °C
LOAD-VOLTAGE STANDING-WAVE RATIO: 1.5 max.

**Typical Operation:**

With load-voltage standing-wave ratio equal to or less than 1.05, except as noted, and with duty factor of 0.001

Heater Voltage. See Operating Considerations
Peak Anode Voltage. 22_kv
Peak Anode Current. 27.5_27.5_amp
Pulse-Repetition Rate. 400_4000_pps
Pulse Duration. 2.5_0.25_μsec
RF Bandwidth with worst phasing of 1.5 VSWR. 0.5_5_Mc
Side Lobes with worst phasing of 1.5 VSWR. 8_10_db
Pulling Figure at VSWR of 1.5. 10_10_Mc
Pushing Figure. 0.2_0.2_Mc/amp
Thermal Factor for any 30° range of anode-block temperature between -55° C and 150° C. 0.2_0.2_Mc/°C
Servo-Drive-Shaft Torque. 6_6_oz-in.
Frequency Deviation due to tuning backlash. 8_8_Mc
Peak Power Output (Approx.) 230_230_kw

- Manufactured by Jettron Products, Hanover, New Jersey.
- Manufactured by Ucinite Division of United-Carr Fastener Corporation, Newtonville 60, Massachusetts.
- For atmospheric pressure greater than 600 millimeters of mercury in the vicinity of the heater-cathode stem. Operation at pressures lower than 600 millimeters of mercury may result in arc-over across the stem with consequent damage to the tube. The waveguide must always be pressurized to a minimum of 15 psi absolute to prevent arcing, especially when there is a mismatched load. Arcing in the waveguide due to lack of pressure can damage the tube.
- It is essential that the input circuit be designed so that if arcing occurs the energy per pulse delivered to the tube cannot greatly exceed the normal energy per pulse. To satisfy this requirement, it is recommended that pulsers of the discharging-network type be used.

### CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td></td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>Peak Anode Voltage.</td>
<td></td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Peak Power Output.</td>
<td></td>
<td>3</td>
<td>200</td>
</tr>
<tr>
<td>Pulses Missing from Total</td>
<td></td>
<td>4.5</td>
<td>9.25</td>
</tr>
</tbody>
</table>

**Note:**
- With 13.75 volts ac or dc on heater.
- With peak anode current of 27.5 amperes. For heater voltage, see Operating Considerations.
- With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 2.5 microseconds, and maximum load-voltage standing-wave ratio equal to or less than 1.05. For heater voltage, see Operating Considerations.

**RADIO CORPORATION OF AMERICA**
Electron Tube Division Harrison, N. J.
Note 4: Pulses are considered to be missing if the energy level at the operating frequency is less than 70 percent of the normal value.

Note 5: With peak anode current of 27.5 amperes corresponding to a peak anode voltage in the order of 22 kv, anode-block temperature of 115° C approx., pulse duration of 0.25 microsecond, and load-voltage standing-wave ratio of 1.5 adjusted in phase to produce maximum instability. For heater voltage, see Operating Considerations.

**OPERATING CONSIDERATIONS**

The high voltage at which the 7111 is operated is very dangerous. Great care should be taken in the design of apparatus to prevent the operator from coming in contact with the high voltage. Precautions include the enclosing of high-potential terminals and the use of interlocking switches to break the primary circuit of the power supply when access to the equipment is required.

**Fastening the JAN RG-51/U waveguide to the waveguide output flange** of the tube is accomplished in the following manner. A JAN UG-52A/U choke flange or equivalent should be modified by drilling out the screw threads from the four mounting holes in the choke flange using a No. 15 drill. This operation will permit four size 8–32 bolts inserted through the flange mounting holes to engage the threaded waveguide output flange of the tube.

Cooling of the anode block is accomplished by directing a separate stream of clean air through each set of cooling fins toward the anode block. The two streams are provided from two 3/4"-diameter ducts placed 1/2" to 3/4" from the fins.

After the heater voltage is raised gradually to its rated value of 13.75 volts, allow the cathode to warm up for at least 2-1/2 minutes to make sure that the cathode reaches operating temperature. When the cathode has reached full operating temperature, high-voltage pulses, negative with respect to anode (ground), can be applied to the heater–cathode terminal. As soon as the high-voltage pulses are applied, the heater voltage (E\textsubscript{f}) should preferably be reduced in accordance with the following formula, depending on the average power input (P\textsubscript{i}) to the tube:

- P\textsubscript{i} up to 450 watts: \( E_f = 13.75 \left(1 - \frac{P_i}{450}\right) \) volts
- P\textsubscript{i} greater than 450 watts: \( E_f = 0 \) volts

In those cases where this type is used as replacement for the fixed-frequency type 4J50, it is permissible to apply the following formula which is specified for reducing the heater voltage on the 4J50.

- P\textsubscript{i} up to 100 watts: \( E_f = 13.75 \) volts
- P\textsubscript{i} greater than 100 watts: \( E_f = 14 \left(1 - \frac{P_i}{1120}\right) \) volts
pulses are not applied to the tube, the heater voltage should be restored to 13.75 volts.

Tuning is accomplished by pushing in on the knurled tuning knob and turning it until the desired setting of the calibrated indicator is reached. Releasing the knob allows a spring to disengage it from the tuning mechanism. The design of the 7111 provides an essentially constant operating frequency without requiring a positive mechanical lock even though the tube is subjected to vibration.

For precise tuning adjustment, the final indicator setting should be approached using the same direction of rotation of the tuning shaft. There is little frequency drift after changing tuner setting.

Our engineers are ready to assist you in circuit applications of the RCA-7111. For further information, write to Commercial Engineering, RCA, Harrison, New Jersey, giving complete details as to the proposed service.

RIEKE DIAGRAM

FREQUENCY (Mc) = 8500
PEAK ANODE AMPERES = 27.5
PULSE DURATION (USEC) = 2.5
PULSE-REPETITION RATE (PPS) = 400

PHASE OF LOAD MEASURED IN FRACTIONS OF GUIDE WAVELENGTH

CIRCLES OF CONSTANT LOAD REFLECTION COEFFICIENT (VSWR)

SINK (REGION OF INSTABILITY)

LINES OF CONSTANT FREQUENCY

LINES OF CONSTANT PEAK POWER OUTPUT

92CM-9629
TYPICAL STABILIZATION CHARACTERISTIC

- Anode Kilovolts (Approx.) = 22
- Peak Anode Amperes = 27.5
- Pulse Duration (µsec) = 1
- Pulse-Repetition Rate (PPS) = 1000
- Cathode Warm-Up Time (Minutes) = 2.5
- Ambient Temperature (°C, Approx.) = 25

TYPICAL COOLING REQUIREMENTS

- Average Anode Max. Id = 27.5
- 22.5
- 20
- 17.5

With Cooling Arrangement Described Under Operating Considerations, Ambient Temperature (°C, Approx.) = 25

Total Flow of Air at Ambient Temperature—CFM

Radio Corporation of America
Electron Tube Division
Harrison, N. J.

Data 3
9-62
REFERENCE PLANE A IS DEFINED AS THE PLANE THROUGH THAT PORTION OF THE MOUNTING FLANGE DESIGNATED AS ANNULAR SURFACE D.

REFERENCE PLANE B IS DEFINED AS THE PLANE WHICH IS PERPENDICULAR TO PLANE A AND PASSES THROUGH THE EXACT CENTERS OF MOUNTING-FLANGE HOLES 2 AND 3.


NOTE 1: SURFACE E OF THE WAVEGUIDE OUTPUT FLANGE AND THE ENTIRE SURFACE OF THE MOUNTING FLANGE ARE MADE SO THAT THEY MAY BE USED TO PROVIDE A HERMETIC SEAL.

NOTE 2: THE AXIS OF THE HEATER-CATHODE TERMINAL WILL BE WITHIN THE CONFINES OF A CYLINDER WHOSE RADIUS IS 3/64" AND WHOSE AXIS IS PERPENDICULAR TO REFERENCE PLANE A AT THE SPECIFIED LOCATION.

NOTE 3: ALL POINTS ON THE MOUNTING FLANGE WILL LIE WITHIN 0.015" ABOVE OR BELOW REFERENCE PLANE A.

NOTE 4: THE LIMITS INCLUDE ANGULAR AS WELL AS LATERAL DEVIATIONS.

NOTE 5: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.168" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER TERMINAL.

NOTE 6: THESE DIMENSIONS DEFINE EXTREMITIES OF THE 0.540" INTERNAL DIAMETER OF THE CYLINDRICAL HEATER-CATHODE TERMINAL.

NOTE 7: NO PART OF THE CONNECTOR DEVICE FOR THE HEATER AND HEATER-CATHODE TERMINALS SHOULD BEAR AGAINST THE UNDERSIDE OF THIS LIP.

NOTE 8: THE HEATER TERMINAL AND THE HEATER-CATHODE TERMINAL ARE CONCENTRIC WITHIN 0.010".

NOTE 9: ANODE TEMPERATURE MEASURED AT JUNCTION OF WAVEGUIDE AND ANODE BLOCK.
NOTE 10: CATHODE TEMPERATURE MEASURED HERE.

NOTE 11: THE ENDS OF THE MOUNTING STUDS MUST NOT PENE- 
TRATE THROUGH THE MOUNTING HOLES MORE THAN 1-3/32" FROM 
THE MOUNTING-FLANGE SURFACE.
EFFECT OF LENGTH OF TRANSMISSION LINE BETWEEN OUTPUT FLANGE AND LOAD ON ALLOWABLE VOLTAGE STANDING-WAVE RATIO

FREQUENCY RANGE (Mc) = 8500 TO 9600
PULLING FIGURE (Mc) = 15
WAVEGUIDE: JAN RG-5/U.

RECOMMENDED OPERATING REGION

TYPICAL THERMAL-FACTOR CHARACTERISTIC

PULSE DURATION (µ SEC) = 1
PULSE-REPETITION RATE (PPS) = 1000
TUBE OPERATING INTO MATCHED LOAD.
TYPICAL PERFORMANCE CHARACTERISTICS

OPERATING FREQUENCY (Mc) = 9000
PULSE DURATION (µ SEC) = 2.5
PULSE-REPETITION RATE (PPS) = 400
LOAD VSWR = 1.05
TYPICAL PERFORMANCE CHARACTERISTICS

PEAK ANODE AMPERES = 27.5
PULSE DURATION (μSEC) = 2.5

FREQUENCY—Mc

92CS-9690

REPRESENTATIVE TUNING CHARACTERISTIC

INDICATOR SETTING

FREQUENCY—Mc

92CS-9691

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS
400 WATTS CW OUTPUT TO 175 Mc
COAXIAL-ELECTRODE STRUCTURE
250 WATTS CW OUTPUT AT 500 Mc
COMPACT DESIGN
INTEGRAL RADIATOR

For Use at Frequencies up to 500 Mc

The 7204 is unilaterally interchangeable with the 41250F and bilaterally interchangeable with the 4CX250F.

The 7204 is the same as the 7203/4CX250F except for the following items:

Heater, for Unipotential Cathode:
Voltage (AC or DC)\(^a\) \(= 26.5 \pm 10\% \text{ volts}\)
Current at heater volts = 26.5 \(\pm 0.58 \text{ amp}\)

\(^a\) Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>0.50</td>
<td>0.62</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Grid No.1 to plate | 0.06 | | µµf
| Grid No.1 to cathode, grid No.2, and heater | 14.2 | 17.2 | µµf
| Plate to cathode, grid No.2, and heater | 4.0 | 4.8 | µµf
| Grid-No.1 Voltage | 1, 3, 4, 5 | -32 | -46 \text{ volts}
| Grid-No.2 Current | 1, 3, 4, 5 | -7 | 3 \text{ ma}
| Useful Power Output | 4, 5, 6 | 225 | - \text{ watts}

Note 1: With 26.5 volts on heater.
Note 2: With cylindrical shield JEDEC No.320 surrounding radiator; and with a cylindrical shield JEDEC No.321 surrounding the grid-No.2 ring terminal. Both shields are connected to ground.
Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and grid-No.1 voltage adjusted to give plate current of 150 ma.
Note 4: With Forced-Air Cooling as specified under GENERAL DATA — Air System Socket.
Note 5: Heater voltage must be applied for at least 30 seconds before application of other voltages.
Note 6: With heater volts = 24.3, dc plate volts = 2000, dc grid-No.2 volts = 300, dc grid-No.1 volts = -90, dc grid-No.1 ma. = 25 maximum, grid-No.1 signal voltage adjusted to produce dc plate current of 250 ma., and coaxial-cavity amplifier-circuit operating frequency (Mc) = 475.

SPECIAL TESTS & PERFORMANCE DATA

Interelectrode Leakage:

This test is destructive and is performed on a sample lot of tubes from each production run under the following conditions.

\[ \rightarrow \] indicates a change.
tions; ac heater volts = 29.1, no voltage on other elements, and specified forced-air cooling for Air-System Socket. At the end of 500 hours, with tube at 25°C, and with no voltage applied to heater, the minimum resistance between indicated electrodes as measured with a 500-volt Megger-type ohmmeter having an internal impedance of 2.5 megohms, will be:

<table>
<thead>
<tr>
<th>Electrode Combination</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No. 1 and grid No. 2</td>
<td>10 min. megohms</td>
</tr>
<tr>
<td>Grid No. 1 and cathode</td>
<td>10 min. megohms</td>
</tr>
<tr>
<td>Grid No. 2 and cathode</td>
<td>10 min. megohms</td>
</tr>
</tbody>
</table>
Beam Power Tube

CERAMIC-METAL SEALS
UNITIZED-ELECTRODE DESIGN
FORCED-AIR COOLED
MATRX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR
2500 WATTS CW INPUT

Useful with Full Ratings at Frequencies up to 1215 Mc

GENERAL DATA

Electrical:
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:

- Voltage (AC or DC)\(^a\) ............... \{5.5 typical\} volts
- Current at heater volts = 5.5. .... \{6 max.\} amp
- Minimum heating time at heater volts = 5.5. ............. 17.3 minutes
- Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 2500, grid-No.2 volts = 600, and plate ma. = 600 . . . 17

Direct Interelectrode Capacitances:
- Grid No.1 to plate\(^b\) ............... 0.17 max. \(\mu\)f
- Grid No.1 to cathode & heater. .... 42 \(\mu\)f
- Plate to cathode & heater\(^bc\) ........ 0.017 max. \(\mu\)f
- Grid No.1 to grid No.2 ............. 55 \(\mu\)f
- Grid No.2 to plate ............. \{16 \(\mu\)f\}
- Grid No.2 to cathode & heater\(^d\) .... 1.4 max. \(\mu\)f

Mechanical:

- Operating Position .................................. Any
- Overall Length .................................. 3.24" ± 0.10"
- Greatest Diameter (See Dimensional Outline) .... 3.72" ± 0.03"
- Weight (Approx.) .................................. 2 lbs
- Radiator .................................. Integral part of tube
- Terminal Connections (See Dimensional Outline):

- \(\text{G}_1\) - Grid-No.1-
  Terminal
  Contact
  Surface
- \(\text{G}_2\) - Grid-No.2-
  Terminal
  Contact
  Surface
- \(\text{H}\) - Heater-
  Terminal
  Contact
  Surface
- \(\text{H}, \text{K}\) - Heater- &
  Cathode-
  Terminal
  Contact
  Surface
- \(\text{P}\) - Plate-
  Terminal
  Contact
  Surface

Thermal:

- Air Flow:

  Through radiator—Adequate air flow to limit the plate-seal temperature to 250° C should be delivered by a blower

\(\Rightarrow\) Indicates a change.
through the radiator before and during the application of heater, plate, grid-No. 2, and grid-No. 1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying Typical-Cooling-Requirements curves. Plate power, grid-No. 2 power, heater power, and air flow may be removed simultaneously.

To grid-No. 2, grid-No. 1, cathode, and heater seals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250°C. An air flow of 10 cfm is usually adequate.

Seal Temperature (Plate, grid No. 2, grid No. 1, cathode, and heater) 250 max. °C

LINEAR RF POWER AMPLIFIER
Single-Sideband Suppressed-Carrier Service

<table>
<thead>
<tr>
<th>Maximum CCS* Ratings, Absolute-Maximum Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE. ..........................</td>
</tr>
<tr>
<td>2500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 (SCREEN-GRID) VOLTAGE .........</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT ..................</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID-No.1 (CONTROL-GRID) CURRENT</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT ........................</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT ....................</td>
</tr>
<tr>
<td>PLATE DISSIPATION ................................</td>
</tr>
</tbody>
</table>

Typical CCS Class AB1 "Single-Tone" Operation:

| DC Plate Voltage. .................. | Up to 60 Mc |
| 2250 2500 volts |
| DC Grid-No.2 Voltage ...... | 700 700 volts |
| DC Grid-No.1 Voltage .......... | -50 -50 volts |
| Zero-Signal DC Plate Current.  | 0.2 0.2 amp |
| Zero-Signal DC Grid-No.2 Current | 0 0 amp |
| Effective RF Load Resistance. | 1100 1100 ohms |
| Max.-Signal DC Plate Current.  | 0.9 1 amp |
| Max.-Signal DC Grid-No.2 Current | 0.045 0.045 amp |
| Max.-Signal DC Grid-No.1 Current | 0 0 amp |
| Max.-Signal Peak RF Grid-No.1 Voltage | 50 50 volts |
| Max.-Signal Driving Power (Approx.) | 0 0 watts |
| Max.-Signal Power Output (Approx.) | 1000 1250 watts |

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with maximum modulation factor of 1

Maximum CCS* Ratings, Absolute-Maximum Values:

| DC PLATE VOLTAGE. .......................... | Up to 1215 Mc |
| 2000 max. volts |
| DC GRID-No.2 (SCREEN-GRID) VOLTAGE ......... | 1000 max. volts |

* Indicates a change.
DC GRID-No.1 (CONTROL-GRID) VOLTAGE. -300 max. volts
DC PLATE CURRENT 0.85 max. amp
DC GRID-No.1 CURRENT 0.2 max. amp
PLATE INPUT 1700 max. watts
GRID-No.2 INPUT 35 max. watts
PLATE DISSIPATION 1000 max. watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc
DC Plate Voltage 1800 2000 volts
DC Grid-No.2 Voltage 500 500 volts
DC Grid-No.1 Voltage 0 0 volts
DC Plate Current 0.75 0.83 amp
DC Grid-No.2 Current 0.015 0.015 amp
DC Grid-No.1 Current (Approx.) 0.04 0.04 amp
Driver Power Output (Approx.) 50 55 watts
Useful Power Output (Approx.) 650 800 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance under any condition 5000 max. ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values:

Up to 1215 Mc
DC PLATE VOLTAGE 2500 max. volts
DC GRID-No.2 (SCREEN-GRID) VOLTAGE 1000 max. volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE -300 max. volts
DC PLATE CURRENT 1 max. amp
DC GRID-No.1 CURRENT 0.2 max. amp
PLATE INPUT 2500 max. watts
GRID-No.2 INPUT 50 max. watts
PLATE DISSIPATION 1500 max. watts

Typical CCS Operation:

In grid-drive circuit at 600 Mc
DC Plate Voltage 2250 2500 volts
DC Grid-No.2 Voltage 500 500 volts
DC Grid-No.1 Voltage 0 0 volts
DC Plate Current 0.9 1 amp
DC Grid-No.2 Current 0.02 0.02 amp
DC Grid-No.1 Current (Approx.) 0.07 0.07 amp
Driver Power Output (Approx.) 70 75 watts
Useful Power Output (Approx.) 1050 1350 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance under any condition 5000 max. ohms
Because the cathode is subjected to considerable back bombardment as
the frequency is increased with resultant increase in temperature, the
heater voltage should be reduced depending on operating conditions
and frequency to prevent overheating the cathode and resultant short
life.

With external, flat, metal shield having diameter of 9" and center
hole approximately 3" in diameter provided with spring fingers that
connect the shield to grid-No.2 terminal. Shield is located in plane
of grid-No.2 terminal perpendicular to the tube axis.

With external, flat, metal shield having diameter of 9" and center
hole approximately 2-3/8" in diameter provided with spring fingers
that connect the shield to grid-No.1 terminal. Shield is located in
plane of grid-No.1 terminal perpendicular to the tube axis.

Continuous Commercial Service.

"Single-Tone" operation refers to that class of amplifier service in
which the grid-No.1 input consists of a monofrequency rf signal having
constant amplitude. This signal is produced in a single-sideband
suppressed-carrier system when a single audio frequency of constant
amplitude is applied to the input of the system.

Preferably obtained from a fixed supply.

Obtained preferably from a separate source modulated along with the
plate supply.

Obtained from grid-No.1 resistor or from a combination of grid-No.1
resistor with either fixed supply or cathode resistor.

The driver stage is required to supply tube losses and rf-circuit
losses. It should be designed to provide an excess of power above
the indicated value to take care of variations in line voltage, in
components, in initial tube characteristics, and in tube characteris-
tics during life.

This value of useful power is measured in load of output circuit.

If this value is insufficient to provide adequate bias, the additional
required bias must be supplied by a cathode resistor or fixed supply.

Key-down conditions per tube without amplitude modulation. Amplitude
modulation essentially negative may be used if the positive peak of
the audio-frequency envelope does not exceed 115% of the carrier
conditions.

Obtained preferably from a fixed supply, or from the plate-supply
voltage with a voltage divider.

Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor,
or by combination methods.

SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7213 have been subjected to the
following tests without adverse effects.

Variable-Frequency Vibration Performance:

This test was performed (per MIL-E-1C, paragraph 4.9.20.3)
der under the following conditions: heater volts = 5.5, plate-
supply volts = 450, grid-No.2 volts = 300, grid-No.1 voltage
varied to give a plate current of 10 milliamperes, and plate
load resistor (ohms) = 2000. The tubes were vibrated in each
of 3 positions through frequency range from 10 to 50 to 10
cycles per second. The vibrating frequency had a fixed
amplitude of 0.040 inch (total excursion of 0.080 inch).

During the test, the tubes did not show an rms output voltage
across the plate load resistor in excess of 500 millivolts.

At the end of this test, the tubes did not show tap or permanent
inter electrode shorts or defects that would cause the tubes to
be inoperable. The tubes exhibited no pronounced mechanical
resonance during this test.

Military Specification, Electron Tubes and Crystal Rectifiers, 3
October 1955.

indicates a change.
Fatigue Performance:

In this test (per MIL-E-1C, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with heater volts = 5.5. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.
GAUGE SKETCH G

**REFERENCE SURFACE A-A**

*THIS SURFACE IS FLAT WITHIN .0005 PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN .00025°.*

THE AXES OF THE CYLINDRICAL HOLES H1 THROUGH H4 AND THE AXIS OF POST P ARE COINCIDENT WITHIN .001°.

92CM-973SR2
TYPICAL COOLING REQUIREMENTS

AIR FLOW THROUGH RADIATOR IN EITHER DIRECTION.
MAXIMUM PLATE-SEAL TEMPERATURE = 250°C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PRESSURE DROP — INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.35</td>
</tr>
<tr>
<td>B</td>
<td>0.6</td>
</tr>
<tr>
<td>C</td>
<td>1.0</td>
</tr>
<tr>
<td>D</td>
<td>1.5</td>
</tr>
</tbody>
</table>

MAXIMUM ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMPERATURE OF 45°C
Typical Characteristics

$E_1 = 5.5 \text{ VOLTS}$

$\text{GRID-}N_2 \text{ VOLTS} = 500$

$IC_1$

$IC_2$

$E_{C1} = +40$

$E_{C1} = 0$

$E_{C1} = -40$

$+20$

$-20$

Plate Volts

Electron Tube Division

General Corporation of America, Harrison, New Jersey

S2CM-9740
Typical Characteristics
Beam Power Tube

CERAMIC METAL SEALS
UNITIZED-ELECTRODE DESIGN
FORCED-AIR COOLED

COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR
MATRX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Pulsed RF Amplifier Service with Full Ratings at Frequencies up to 1215 Mc

GENERAL DATA

Electrical:
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:
Voltage (AC or DC) \[5.5 \text{ typical volts}\] \[6 \text{ max. volts}\]
Current at heater volts = 5.5 \[17.3 \text{ amp}\]
Minimum heating time at heater volts = 5.5 \[5 \text{ minutes}\]
Mu-Factor, Grid-No.2 to Grid No.1 for plate volts = 2500, grid-No.2 volts = 600, and plate ma. = 600 \[19\]
Direct Interelectrode Capacitances:
Grid No.1 to plate\[0.17 \text{ max. } \mu\text{f}\]
Grid No.1 to cathode & heater \[42 \mu\text{f}\]
Plate to cathode & heater \[0.017 \text{ max. } \mu\text{f}\]
Grid No.1 to grid No.2 \[55 \mu\text{f}\]
Grid No.2 to plate \[16 \mu\text{f}\]
Grid No.2 to cathode & heater \[1.4 \text{ max. } \mu\text{f}\]

Mechanical:
Operating Position \[\text{Any}\]
Overall Length \[3.24" \pm 0.10"\]
Greatest Diameter (See Dimensional Outline) \[3.72" \pm 0.03"\]
Weight (Approx.) \[2 \text{ lbs}\]
Radiator \[\text{Integral part of tube}\]
Terminal Connections (See Dimensional Outline):

G1 - Grid-No.1-
Terminal Contact Surface
G2 - Grid-No.2-
Terminal Contact Surface
H - Heater-
Terminal Contact Surface

H, K - Heater- &
Cathode-Terminal Contact Surface
P - Plate-
Terminal Contact Surface

\[\rightarrow\] Indicates a change.
Thermal:

Air Flow:

Through radiator—Adequate air flow to limit the plate seal temperature to 250°C should be delivered by a blower through the radiator before and during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus percentage of maximum rated plate dissipation for each class of service are shown in accompanying Typical Cooling-Requirements curves. Plate power, grid-No.2 power, heater power, and air flow may be removed simultaneously.

To grid-No.2, grid-No.1, cathode, and heater seals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these seals so that its temperature does not exceed the specified maximum value of 250°C. An air flow of 10 cfm is usually adequate.

Seal Temperature (Plate, grid No.2, grid No.1, cathode, and heater) .... 250 max. °C

GRID-PULSED RF AMPLIFIER

Maximum CCSd Ratings, Absolute-Maximum Values:

For maximum "on" time* of 10 microseconds.

\[
\begin{array}{l}
\text{Up to 1215 Mc} \\
\begin{align*}
\text{DC PLATE VOLTAGE} & : 5000 \text{ max. volts} \\
\text{DC GRID-No.2 (SCREEN-GRID) VOLTAGE} & : 1200 \text{ max. volts} \\
\text{DC GRID-No.1 (CONTROL-GRID) VOLTAGE} & : -300 \text{ max. volts} \\
\text{DC PLATE CURRENT DURING PULSE} & : 18 \text{ max. amp} \\
\text{DC PLATE CURRENT} & : 0.2 \text{ max. amp} \\
\text{GRID-No.2 INPUT (Average)} & : 50 \text{ max. watts} \\
\text{GRID-No.1 INPUT (Average)} & : 30 \text{ max. watts} \\
\text{PLATE DISSIPATION (Average)} & : 1500 \text{ max. watts}
\end{align*}
\]

Typical Operation:

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor of 0.01

\[
\begin{align*}
\text{DC Plate Voltage} & : 4500 \text{ volts} \\
\text{DC Grid-No.2 Voltage} & : 1000 \text{ volts} \\
\text{DC Grid-No.1 Voltage} & : -80 \text{ volts} \\
\text{DC Plate Current during pulse} & : 11 \text{ amp} \\
\text{DC Plate Current} & : 0.11 \text{ amp} \\
\text{DC Grid-No.2 Current} & : 0.005 \text{ amp} \\
\text{DC Grid-No.1 Current} & : 0.01 \text{ amp} \\
\text{Driver Power Output at peak of pulse (Approx.)} & : 4.5 \text{ kw} \\
\text{Useful Power Output at peak of pulse (Approx.)} & : 20 \text{ kw}
\end{align*}
\]
PLATE- AND SCREEN-PULSED RF AMPLIFIER

**Maximum CCS\(^4\) Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAK POSITIVE-PULSE PLATE VOLTAGE</td>
<td>10000 max. volts</td>
</tr>
<tr>
<td>PEAK POSITIVE-PULSE GRID-No.2 (SCREEN-GRID) VOLTAGE</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 (CONTROL-GRID) VOLTAGE</td>
<td>-300 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT DURING PULSE</td>
<td>18 max. amp</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.2 max. amp</td>
</tr>
<tr>
<td>GRID-No.2 INPUT (Average)</td>
<td>50 max. watts</td>
</tr>
<tr>
<td>GRID-No.1 INPUT (Average)</td>
<td>30 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION (Average)</td>
<td>1500 max. watts</td>
</tr>
</tbody>
</table>

**Typical Operation:**

In class C cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor\(^6\) of 0.01

- Peak Positive-Pulse Plate Voltage: 9000 volts
- Peak Positive-Pulse Plate Voltage: 10000 volts
- DC Grid-No.1 Voltage: -80 volts
- DC Grid-No.2 Voltage: -16 volts
- DC Plate Current during pulse: 0.16 amp
- DC Grid-No.2 Current: 0.008 amp
- DC Grid-No.1 Current: 0.014 amp
- Driver Power Output at peak of pulse (Approx.): 10 kw
- Useful Power Output at peak of pulse (Approx.): 50 kw

\(^4\) Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

\(^5\) With external, flat, metal shield having diameter of 8\(^\prime\), and center hole approximately 2-3/8\(^\prime\) in diameter provided with spring fingers that connect the shield to grid-No.2 terminal. Shield is located in plane of grid-No.2 terminal perpendicular to the tube axis.

\(^6\) With external, flat, metal shield having diameter of 8\(^\prime\), and center hole approximately 2-3/8\(^\prime\) in diameter provided with spring fingers that connect the shield to grid-No.1 terminal. Shield is located in plane of grid-No.1 terminal perpendicular to the tube axis.

\(^7\) Continuous Commercial Service.

\(^8\) "On" time is defined as the sum of the durations of the individual pulses which occur during any 1000-microsecond interval.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

\(^9\) Duty factor for the 7214 is defined as the "on" time in microseconds divided by 1000 microseconds.

The driver stage is required to supply tube losses, rf-circuit losses, and in cathode-drive circuits, the rf power added to the plate input. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.
SPECIAL TESTS & PERFORMANCE DATA

Design samples of the 7214 have been subjected to the following tests without adverse effects.

Variable-Frequency Vibration Performance:

This test was performed (per MIL-E-10h, paragraph 4.9.20.3) under the following conditions: Heater voltage of 5.5 volts, plate supply voltage of 450 volts, grid-No.2 voltage of 300 volts, grid-No.1 voltage varied to give a plate current of 10 milliamperes, and plate load resistor of 2000 ohms. The tubes were vibrated in each of 3 positions through frequency range from 10 to 50 cycles per second and back to 10 cycles per second. The vibrating frequency had a fixed amplitude of 0.040 inch (total excursion of 0.080 inch). During the test, the tubes did not show an rms output voltage across the plate load resistor in excess of 500 millivolts.

At the end of this test, the tubes did not show tap or permanent interelectrode shorts or defects that would cause the tubes to be inoperable. The tubes exhibited no pronounced mechanical resonance during this test.

Fatigue Test:

In this test (per MIL-E-10, paragraph 4.9.20.6), the tubes were rigidly mounted and subjected to 2.5 g vibrational acceleration at 25 cycles per second for 32 hours in each of three positions with 5.5 volts applied to the heater. At the end of this test, the tubes did not show permanent or temporary shorts or open circuits, and passed all electrical tests.

OPERATING CONSIDERATIONS

The maximum seal temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made by the Tempil Corporation, 132 W. 22nd Street, New York II, New York in the form of liquid and stick.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.


→ Indicates a change.
NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE RADIATOR BAND, PLATE TERMINAL, GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND HEATER TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G1. PROPER ENTRY OF THE TUBE IS OBTAINED WHEN THE GRID-No.2 TERMINAL IS SEATED ON THE SHOULDER A-A'. THE TUBE IS PROPERLY SEATED ON THE SHOULDER WHEN A 0.010"-THICKNESS GAUGE 1/8" WIDE WILL NOT ENTER MORE THAN 1/16" BETWEEN THE SHOULDER SURFACE AND THE GRID-No.2 TERMINAL. THE GAUGE IS PROVIDED WITH SLOTS TO PERMIT MAKING MEASUREMENT OF SEATING OF GRID-No.2 TERMINAL ON SHOULDER A-A'.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLIED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.
Gauge Sketch G

This surface is flat within .0005 peak to valley and is perpendicular to the axis of the cylindrical holes within .00025.

The axes of the cylindrical holes H1 through H5 and the axis of post P are coincident within .001.

REFERENCE SURFACE A-X

Detail of post P

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

E4 = 5.5 VOLS
GRID-N2 VOLS = 1000
IC = GRID-N1 AMPERES
IC2 = GRID-N2 AMPERES

GRID-N1 VOLS
ELECTRO TUBE DIVISION

72/4

0000 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
0 200 400 600 800 1000

Graph showing typical constant-current characteristics with various lines indicating IC and IC2 values.
DC GRID-No.1 CURRENT: 30 max. ma
PLATE INPUT: 180 max. watts
GRID-No.2 INPUT: 4.5 max. watts
PLATE DISSIPATION: 115 max. watts

Typical CCS Operation:

<table>
<thead>
<tr>
<th></th>
<th>At 400 Nc</th>
<th>At 1215 Nc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400</td>
<td>900</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-35</td>
<td>-22</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>150</td>
<td>170</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>23</td>
<td>40</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition: 30000 ohms max.

a. Because the cathode is subjected to considerable bombarding as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.

b. Measured with special shield adapter.

c. For socket to be used with the 7457, consult manufacturers such as J-V-W Microwave Company, 9300 West 47th Street, Brookfield, Illinois; E.F. Johnson Company, Waseca, Minnesota; and Collins Radio Company, 855 35th Street North, Cedar Rapids, Iowa.

d. Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

e. Continuous Commercial Service.

f. Averaged over any audio-frequency cycle of sine-wave form.

g. Preferably obtained from a fixed supply.

h. The driver stage should be capable of supplying the No.1 grids of the Class AB2 stage with the specified driving voltage at low distortion.

i. The resistance introduced into the grid-No.1 circuit by the input coupling should be held to a low value. In no case should it exceed the specified maximum value. Transformer or impedance coupling devices are recommended.

j. Subscript 2 indicates that grid-No.1 current flows during some part of the input cycle.

k. Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the AB2 stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the AB2 stage should be held at a low value. For this purpose, the use of transformer coupling is recommended.

l. "Single-Tone" operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

m. Obtained preferably from a separate source modulated along with the plate supply.

n. Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

o. The driver stage is required to supply tube losses and rf-circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

p. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.

Obtained from fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ Heater Current.</td>
<td>1</td>
<td>2.90</td>
</tr>
</tbody>
</table>

Direct Interelectrode Capacitances:

- Grid No.1 to plate: 2 | ~ | 0.085 | μf |
- Grid No.1 to cathode & heater: 2 | 11.8 | 15.2 | μf |
- Plate to cathode & heater: 2 | ~ | 0.019 | μf |
- Grid No.1 to grid No.2: 2 | 17.3 | 21.9 | μf |
- Grid No.2 to plate: 2 | 4 | 5.1 | μf |
- Grid No.2 to cathode & heater: 2 | ~ | 1.30 | μf |
- → Grid-No.1 Voltage: 1.9 | ~ | -10 | volts |
- Reverse Grid-No.1 Current: 1.3 | ~ | -20 | μa |
- Grid-No.2 Current: 1.3 | ~ | +2 | mA |
- Peak Emission: 1.4 | ~ | 400 | peak volts |

Interelectrode Leakage Resistance: 5 | 1 | ~ | megohm |

Useful Power Output: 6 | 60 | ~ | watts |

Note 1: With 6.3 volts ac or dc on heater.

Note 2: Measured with special shield adapter.

Note 3: With dc plate volts = 1000, dc grid-No.2 volts = 300, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 ma.

Note 4: For conditions with heater volts = 6.3; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate and cathode. Pulse duration (microseconds) = 2, pulse-repetition frequency (pps) = 60, and duty factor of 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 400 volts (peak).

Note 5: Under conditions with tube at 20°C 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 megohm, will be 1 megohm.

Note 6: In a single-tube, grid-driven coaxial-cavity class-C-amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate volts = 1000, dc grid-No.2 volts = 300, grid-No.1 resistor adjustable between 1000 and 10,000 ohms, dc plate ma. = 180 maximum, dc grid-No.1 ma. = 20 maximum, and driver power output (watts) = 3.

SPECIAL TESTS & PERFORMANCE DATA

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube

→ indicates a change.
Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, New Jersey, on request.

50 g, 11-Millisecond Shock Test:

This test is performed on a sample lot of tubes from each production run to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes are required to meet the limits for Items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

500 g, Nominal 3/4-Millisecond Shock Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet the limits for Items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

5-to-2000 cps Variable Frequency and Cycling Vibration Test:

This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater volts = 6.3 ac or dc, dc plate supply volts = 300, dc grid-No.2 volts = 250, grid-No.1 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

a. 5-to-10 cps with fixed double amplitude of 0.080 inch ± 10%.

b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.

c. 15-to-75 cps with fixed double amplitude of 0.036 inch ± 10%.

d. 75-to-2000 cps at fixed acceleration of 10 g ± 10%.

During the above vibration test, tubes will not show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-to-2000 cycle range. At the end of this test, tubes are required to meet the limits for items 1, 3, 4, 7, and 8 under Characteristics Range Values for Equipment Design.

OPERATING CONSIDERATIONS

A suggested mounting arrangement for the 7457 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

During standby periods in intermittent operation, it is recommended that the heater voltage be maintained at normal operating value when the period is less than 15 minutes, and that it be reduced to 80 per cent of normal when the period is
voltage should be turned off.

The rated plate and grid-No. 2 voltages of this tube are extremely dangerous to the user. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

NOTE 2: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.
THE AXES OF THE CYLINDRICAL HOLES H₀ THROUGH H₄ AND THE AXES OF POST P ARE COINCIDENT WITHIN 0.001".
Beam Power Tube

Cermolox Forced-Air Cooled

80 Watts CW Power Output at 400 MHz
40 Watts CW Power Output at 1215 MHz

For Applications in Which Dependable Performance Under Severe Shock and Vibration is Essential

ELECTRICAL

Heater for Matrix-Type Oxide-Coated Unipotential Cathode:

- Voltage (ac or dc) ............. 6.3 ± 10% V
- Current at 6.3 volts .......... 3.2 A
- Minimum heating time ........ 1 minute

Mu-Factor, Grid No.2 to Grid No.1 ................ 18

Direct Intelectrode Capacitances:

- Grid No.1 to plate .......... 0.065 max. pF
- Grid No.1 to cathode & heater .... 14 pF
- Plate to cathode & heater ...... 0.019 pF
- Grid No.1 to grid No.2 ........ 19 pF
- Grid No.2 to plate ........ 4.5 pF
- Grid No.2 to cathode & heater .... 1.30 pF

MECHANICAL

- Operating Position ........ Any
- Overall Length ........ 1.880" ± .050"
- Greatest Diameter ........ 1.265" max.
- Terminal Connections .... See Dimensional Outline

For operation up to 400 MHz

Socket, including Grid-No.2

- Bypass Capacitor .......... Erie \textsuperscript{b} 2948-000, E.F. Johnson \textsuperscript{c}
- DN124-152-1, Jettrond \textsuperscript{d} 89-001, or equivalent

Grid-No.2 Bypass

- Capacitor ................. Erie \textsuperscript{b} 2926-000, 2929-001, or equivalent

For operation at high frequencies

See Accompanying Preferred Mounting Arrangement

Radiator ...................... Integral part of tube

Weight (Approx.) .............. 2 oz.

IMEM Elec Ironic Components

DATA 1 1-68
THERMAL

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

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 plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed across the radiator versus plate dissipation are shown in two graphs under Typical Cooling Requirements.

To Plate, 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. Plate 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.

AF POWER AMPLIFIER & MODULATOR — Class AB₁

Maximum CCS Ratings, Absolute-Maximum Values:
DC Plate Voltage ................................................. 1000 max. volts
DC Grid-No.2 Voltage ............................................ 300 max. volts
Max.-Signal DC Plate Current .................................. 180 max. mA
Max.-Signal Plate Input .......................................... 180 max. watts
Max.-Signal Grid-No.2 Input .................................... 4.5 max. watts
Plate Dissipation .................................................. 115 max. watts

Typical CCS Operation:
Values are for 2 tubes
DC Plate Voltage .................................................. 650 850 volts
DC Grid-No.2 Voltage ............................................ 300 300 volts
DC Grid-No.1 Voltage:
   From fixed-bias source ...................................... -15 -15 volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage .................. 30 30 volts
Zero-Signal DC Plate Current .................. 80 mA
Max.-Signal DC Plate Current .................. 200 mA
Zero-Signal DC Grid-No.2 Current ............... 20 mA
Max.-Signal DC Grid-No.2 Current ................ 20 mA
Effective Load Resistance
(Plate to plate) .................. 4330 7000 ohms
Max.-Signal Driving Power (Approx.) .............. 0 watt
Max.-Signal Power Output (Approx.) .............. 50 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance under Any Condition:
With fixed bias ...................... 30,000 max. ohms
With cathode bias ........................ Not recommended

AF POWER AMPLIFIER & MODULATOR – Class AB2
Maximum CCS Ratings, Absolute-Maximum Values:

DC Plate Voltage .................. 1000 max. volts
DC Grid-No.2 Voltage .................. 300 max. volts
Max.-Signal DC Plate Current ............... 180 max. mA
Max.-Signal DC Grid-No.1 Current ............... 30 max. mA
Max.-Signal Plate Input .................. 180 max. watts
Max.-Signal Grid-No.2 Input .................. 4.5 max. watts
Plate Dissipation .................. 115 max. watts

Typical CCS Operation:
Values are for 2 tubes

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

Electronic Components
### PLATE-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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>800 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>150 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>30 max. mA</td>
</tr>
<tr>
<td>Plate Input</td>
<td>120 max. watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>3 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>75 max. watts</td>
</tr>
</tbody>
</table>

**Typical CCS Operations**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400 700 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 250 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-20 -50 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>100 130 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5 10 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>5 10 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>2 3 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>16 45 watts</td>
</tr>
</tbody>
</table>

#### Maximum Circuit Values:

- Grid-No.1-Circuit Resistance under Any Condition: 30,000 max. ohms

### RF POWER AMPLIFIER & OSCILLATOR

**Class C Telegraphy**

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>180 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>30°C max. mA</td>
</tr>
<tr>
<td>Plate Input</td>
<td>180 max. watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>4.5 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>115 max. watts</td>
</tr>
</tbody>
</table>

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*DATA 2*
### Typical CCS Operation:

<table>
<thead>
<tr>
<th></th>
<th>At 400 MHz</th>
<th>At 1215 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>400</td>
<td>900</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-35</td>
<td>-30</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>150</td>
<td>170</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>23</td>
<td>80</td>
</tr>
</tbody>
</table>

### Maximum Circuit Values:

- **Grid-No.1-Circuit Resistance under Any Condition**: 30,000 max. ohms

### LINEAR RF POWER AMPLIFIER

**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:

<table>
<thead>
<tr>
<th></th>
<th>Up to 1215 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300 max. volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>250° max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>30 max. mA</td>
</tr>
<tr>
<td>Plate Input</td>
<td>180 max. watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>4.5 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>115 max. watts</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>At 30 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>650</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>300</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-18.5</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>40</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>2200</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>100</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>75</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td>8.2</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>3.6</td>
</tr>
<tr>
<td>Peak-Envelope Driver Power Output (Approx.)</td>
<td>0.5</td>
</tr>
</tbody>
</table>
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 watts
  Peak envelope .......................... 25 40 watts

Maximum Circuit Values:
Grid-No.1 Circuit Resistance
  Under Any Condition:
    With fixed bias .......................... 25000 max. ohms
    With fixed bias (In Class AB1 operation) ........ 100000 max. ohms
    With cathode bias ................................ Not recommended

Grid-No.2 Circuit Impedance
  .............................. 10000 max. ohms

* Measured with special shield adapter.

b Erie Technological Products, Inc., 2206 West 15th Street, Erie, Pennsylvania.

c E.F. Johnson Co., 299 10th Ave., S.W., Waseca, Minn.

d Jettron Products, Inc., 56 Rt. 10, Hanover, N.J.

* The maximum dc plate current at peak of envelope is 250 mA
dc for a signal having a minimum peak-to-average power ratio of 2. During short periods of circuit adjustment under “Single-Tone” conditions, the average plate current may be as high as 250 mA. 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.

f In applications where the frequency is less than 80 MHz and the bias is less than -50 volts, the maximum value is 40 mA.

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

g See Electrical Considerations—Filament or Heater.

h See Cooling Considerations—Forced Air Cooling.

i See Classes of Service.

k See Electrical Considerations—Grid No.2 Voltage Supply.
<table>
<thead>
<tr>
<th>CHARACTERISTICS RANGE VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Note</strong></td>
</tr>
<tr>
<td>1. Heater Current</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2. Direct Intelectrode Capacitances:</td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4. Reverse Grid-No.1 Current</td>
</tr>
<tr>
<td>5. Grid-No.2 Current</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>6. Peak Emission</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>7. Intelectrode Leakage</td>
</tr>
<tr>
<td>Resistance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8. Useful Power Output</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** With 6.3 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 115 mA.

**Note 4:** With grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate 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 the value specified.

**Note 5:** 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 exceed the value specified.
Note 6: In a single-tube, grid-driven coaxial-tuned amplifier circuit at 400 MHz and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 1000 volts, dc grid-No.2 voltage of 300 volts, grid-No.1 voltage adjustable for dc plate current of 180 mA maximum, dc grid-No.1 current of 30 mA maximum and driver power output of 3 watts maximum.

SPECIAL TESTS AND PERFORMANCE DATA

The environmental conditions shown for the tests below are those applied directly to the tube. Extreme care must be used in the design of the mountings to minimize mounting resonances.

50g, 11-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a medium impact shock machine and are subjected to three blows in each position.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under Characteristics Range Values.

500g, Nominal 3/4-Millisecond Shock Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a high-impact shock machine and are subjected to five blows in each position.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under Characteristics Range Values.

5-2000 Hz Variable Frequency Vibration Test:

This test is performed on samples of tubes to determine the ability of the tube to withstand variable frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage adjusted to give dc plate current of 10 mA, and plate load resistor of 2000
ohms. This tube is vibrated along each of three mutually perpendicular axes over an 8-minute sweep consisting of:

a. 5-10 Hz with fixed double amplitude of 0.080 inch ±10%.
b. 10-15 Hz at fixed acceleration of 0.41 g ± 10%.
c. 15-75 Hz with fixed double amplitude of 0.036 inch ±10%.
d. 75-2000 Hz at fixed acceleration of 0 g ± 10%.

During the above vibration tests, tubes will show an rms output voltage in excess of 15 volts across the plate load resistor in the 5-2000 hertz range.

At the end of this test, tubes are required to meet the limits for items 3 and 4 under Characteristics Range Values.

**TERMINAL DIAGRAM**

**NOTES FOR 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 – 1.316"
- b. Plate 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 – 0.240"
- 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.
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., Little Falls, N.J.
RECOMMENDED COWLING
For Directing Air Flow Through Radiator
TYPICAL COOLING REQUIREMENTS
With Cowling

AIR FLOW DIRECTED THROUGH RADIATOR WITH COWLING AS SHOWN IN ACCOMPANYING DIAGRAM.

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PRESSURE DROP—INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B, C, D, E</td>
<td>LESS THAN 0.1</td>
</tr>
</tbody>
</table>

MAX. ALLOWABLE TEMPERATURE RISE WITH INCOMING-AIR TEMPERATURE OF 25°C

PLATE TERMINAL-TEMPERATURE RISE ABOVE INCOMING-AIR TEMPERATURE

PLATE DISSIPATION—WATTS

92CM-9219RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 7
9-62
TYPICAL COOLING REQUIREMENTS
Without Cowling

AIR FLOW DIRECTED THROUGH RADIATOR
FROM 1" X 1 1/2" ORIFICE LOCATED 1 1/4"
FROM RADIATOR.

MAX. ALLOWABLE TEMPERATURE
RISE WITH INCOMING-AIR TEMPERATURE OF 25°C

PLATE TERMINAL-TEMPERATURE RISE ABOVE INCOMING-AIR TEMPERATURE — °C

PLATE DISSIPATION—WATTS

92CM-9220RI

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TUNING CHARACTERISTICS

GRID No. 2 TO GRID No. 1

GRID No. 1 TO CATHODE

CHARACTERISTIC
IMPEDANCE = 40.4 OHMS

92CS-14833

92CS-14834
TUNING CHARACTERISTICS

GRID No.2 TO PLATE TERMINAL
PLATE TERMINAL
GRID-No.2 TERMINAL

CHARACTERISTIC IMPEDANCE = 15.2 OHMS

CAVITY LENGTH L — INCHES

FREQUENCY — MHZ

0 500 1000 1500

1/2" OD
1 15/16" ID

DUCEL Electronic Components
Tunable Oscillator Triode

PENCIL TYPE WITH INTEGRAL RESONATORS
For Radiosonde Service at Frequencies between 1660 and 1700 Mc.

GENERAL DATA

**Electrical:**
- Heater, for Unipotential Cathode:
  - Voltage range (AC or DC) ........... 5.2 to 6.6 volts
  - Current at 6 volts ................. 0.16 amp
  - Frequency (Approx.) ............... 1680 Mc
- Tuning Range ....................... 1660 to 1700 Mc
- RF Coaxial Output Terminal:
  - Characteristic impedance (Approx.) .... 50 ohms
- Tuning Screws (2):
  - Maximum Torque (Absolute) at tuning-range stops ........... 6.5 oz-in.

**Mechanical:**
- Operating Position .................. Any
- Dimensions .............................. See Dimensional Outline
- Tunable Resonators (2) ............... Integral part of tube
- Weight (Approx.) ....................... 0.8 oz
- Terminal Connections (See Dimensional Outline):

![Diagram of UHF Oscillator](image)

**UHF OSCILLATOR — Class C**

**Maximum and Minimum Ratings, Absolute-Maximum Values:**
At frequencies between 1660 and 1700 Mc and altitudes up to 100,000 feet

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE-TO-GRID VOLTAGE</td>
<td></td>
<td>130 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td></td>
<td>34 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td></td>
<td>8 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td></td>
<td>4 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td></td>
<td>3.6 max. watts</td>
</tr>
<tr>
<td>AMBIENT-TEMPERATURE RANGE</td>
<td></td>
<td>-55 to +75 °C</td>
</tr>
</tbody>
</table>

**Typical Operation as Cathode-Driven Oscillator:**
At frequency of

<table>
<thead>
<tr>
<th>Frequency (Mc)</th>
<th>1660</th>
<th>1680</th>
<th>1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>124.5</td>
<td>124</td>
<td>123</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 1
10-60
At frequency of 1660 1680 1700 Mc

<table>
<thead>
<tr>
<th>Voltage/Current</th>
<th>1660</th>
<th>1680</th>
<th>1700</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>7.5</td>
<td>6.75</td>
<td>6</td>
<td>volts</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>ohms</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>35</td>
<td>31.5</td>
<td>32</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5</td>
<td>4.5</td>
<td>6</td>
<td>ma</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>575</td>
<td>575</td>
<td>475</td>
<td>mw</td>
</tr>
</tbody>
</table>

Circuit Values:

Grid-Circuit Resistance: 2400 max. ohms
1300 min. ohms

- This range of heater voltage is for radiosonde applications in which the heater is supplied from batteries and in which the equipment design requirements of minimum size, light weight, and high efficiency are the primary considerations even though the average life expectancy of the 7533 in such service is only a few hours.
- As supplied, tubes are adjusted to 1680 ± 4 Mc.

## CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.135</td>
<td>0.157</td>
</tr>
<tr>
<td>Grid Resistor</td>
<td>2</td>
<td>1300</td>
<td>2400</td>
</tr>
<tr>
<td>Useful Power Output (1)</td>
<td>3</td>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>4</td>
<td>-</td>
<td>34</td>
</tr>
<tr>
<td>Useful Power Output (2)</td>
<td>5</td>
<td>250</td>
<td>-</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>6</td>
<td>-</td>
<td>34</td>
</tr>
<tr>
<td>Useful Power Output (3)</td>
<td>7</td>
<td>270</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1: With 5.2 volts on heater.

Note 2: With heater voltage of 5.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, frequency adjusted to 1660 ± 1 Mc, output VSWR of 1.1 maximum, and grid resistor adjusted to give plate current as close as possible to, but not exceeding 35 ma. Record Grid-Resistor value.

Note 3: With frequency and grid-resistor value of Note 2, decrease heater voltage and plate supply voltage to 5.2 volts and 95 volts, respectively, and measure Useful Power Output.

Note 4: With heater voltage of 6.6 volts, plate supply voltage of 117 volts, plate load resistor of 50 ohms, using same value of grid resistor as determined in Note 2, frequency adjusted to 1700 ± 3 Mc, and output VSWR of 1.1 maximum.

Note 5: Same as Note 2, except heater voltage and plate supply voltage are 5.2 volts and 95 volts, respectively.

Note 6: Same as Note 4, except frequency is adjusted to 1680 ± 4 Mc with VSWR of 1.1 maximum.

Note 7: Same as Note 6, except heater voltage and plate supply voltage are 5.2 volts and 95 volts, respectively.

## SPECIAL TESTS & PERFORMANCE DATA

### Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Arcing will not occur when an rms voltage of 200 volts is applied between the plate terminal and the grid terminal and heater–cathode terminal tied together.
High-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated in two planes, parallel and perpendicular respectively to its axis, with no voltages applied to the tube. Vibration frequency is 50-to-60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits.

Shorts and Continuity Test:

This test (similar to MIL-E-1D, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit.

Temperature-Frequency Performance:

This test is performed on a sample lot of tubes from each production run to determine the ability of this tube type to maintain the oscillator frequency without significant change when ambient temperature and operating voltages are reduced gradually during a given time interval. Tube under test is operated with a heater voltage of 6.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, oscillator frequency of 1680 ± 4 Mc, output VSWR of 1.1 maximum, dc plate current of not more than 34 ma. obtained by adjusting the value of the grid resistor between 1300 and 2400 ohms, and at an ambient temperature of approximately 22°C for a period of 5 minutes. Record Oscillator Frequency. The ambient temperature is then gradually reduced to -40°C during a 30-minute operating period. Both the heater voltage and plate supply voltage are reduced simultaneously so that during the final 15-minute interval of this test period the heater voltage is 5.2 volts and the plate supply, voltage is 95 volts. Any change in frequency will not be more than ±4 Mc or -1 Mc from the recorded initial test value. The rate of frequency change during this test will not exceed 2 Mc in any 15-second interval.

5-Hour Radiosonde Life Performance:

This test is performed on a sample lot of tubes from each production run under conditions of maximum-rated plate dissipation to insure excellent performance in radiosonde applications. Each tube tested is operated for 5 hours under the following conditions: heater voltage of 6.6 volts, dc plate supply voltage of 117 volts, plate load resistor of 50 ohms, dc plate current of 34 ma., obtained by adjusting the grid-resistor value between 1300 and 2400 ohms, oscillator frequency of 1680 ± 4 Mc and output VSWR of 1.1 maximum. At the end of 5 hours, the tubes will not show permanent shorts or open circuits, and will meet the following limits:

Useful Power Output (3)... 210 min. mw

For conditions shown under Characteristics Range Values.

Notes 6, 7.
Change in Useful Power
Output (3) From initial Value . . . . . . 30 max. %
For conditions shown under Characteristics Range Values,
Notes 6, 7.

OPERATING CONSIDERATIONS

The flexible heater leads of the 7533 may be soldered to
the circuit elements, but not closer than 3/4" from the
surface of the glass button. Otherwise the heat of the
soldering operation may crack the glass button and damage
the tube.

Support for the 7533 should be provided by a suitable
clamp around the metal shell of the tube, preferably in the
indicated zone shown on the Dimensional Outline. Care must
be taken to avoid clamping so tightly as to cause distortion
of the resonator cavity with resultant change in operating
frequency.

Connections to the grid terminal and to the plate terminal
should be made by means of spring contacts only. Under no
circumstances should connections be soldered to these terminals.

Accurate frequency adjustment in the 1660-to-1700-Mc
operating range together with minimum frequency drift, may be
obtained by using both tuning screws. Alternately turn each
tuning screw not more than one-half turn at a time, in a
clockwise direction to lower the frequency. Repeat this
procedure until the desired lower frequency adjustment is
reached. To reach a higher frequency, follow the same
procedure except that the tuning screws are turned in a
counterclockwise direction.
NOTE 1: THE AXES OF THE INNER AND OUTER CONDUCTORS OF THE COAXIAL OUTPUT TERMINAL COINCIDE WITHIN 0.010".

NOTE 2: THE END OF THE INSULATOR IN THE COAXIAL OUTPUT TERMINAL ALIGNS WITH THE EDGE OF THE OUTER CONDUCTOR (0.151" ± 0.003" DIAMETER) WITHIN 0.005".

NOTE 3: DISTANCE BETWEEN CENTER LINE OF PLATE TERMINAL AND CENTER LINE OF INNER CONDUCTOR (0.040" ± 0.001" DIAMETER).

NOTE 4: ORIENTATION OF PINCH-OFF IS NOT CONTROLLED.

NOTE 5: STIPPLED REGION (WHICH EXTENDS AROUND TUBE) INDICATES RECOMMENDED CLAMPING AND CONTACT AREA.
High-Mu Triode

CERAMIC-METAL PENCIL TYPE
FAST WARM-UP TIME
STURDY COAXIAL-ELECTRODE STRUCTURE
For Use at Frequencies up to 5000 Mc in Cathode-Drive Circuits under Severe Shock and Vibration

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) .................................. 6.3 ± 10% volts
Current at heater volts = 6.3 .................. 0.225 amp
Cathode Warm-Up Time (Average) to reach 80% of operating plate current for dc plate supply volts = 80, grid volts = 0, cathode resistor (ohms) = 0, load resistor (ohms) = 10, heater volts = 6.3 .................. 10 sec
Amplification Factor ................................ 70
Transconductance for dc plate ma. = 14, dc plate volts = 125, and cathode resistor (ohms) = 50 .................. 16000 μmhos
Direct Interelectrode Capacitances:
Grid to plate ........................................ 2.4 μf
Grid to cathode and heater ...................... 4.4 μf
Plate to cathode and heater ...................... 0.04 max. μf
Heater to cathode .................................. 2.6 μf
Cathode to plate .................................. 0.04 max. μf
Cathode to grid and heater ...................... 7.0 μf
Plate to grid and heater ......................... 2.4 μf

Mechanical:
Operating Position ................................ Any
Dimensions. ...................................... See Dimensional Outline
Weight (Approx.) ................................ 0.3 oz
Sockets:
Heater-terminals connector ...................... Amerac® No.1018-88®,
Grayhill® No.22-5, or equivalent
Socket for operation up to about 550 Mc (Including heater-terminals connector) .................. Jettron® No.CD7010,
or equivalent
Cavities (Including heater-terminals connector) .................. Amerac No.1718 (for 4150 Mc),
J-V-M® No.D-7980 Series,
Resdel® No.10 Series,
or equivalent

...Indicates a change.
RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy and RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS¹ Ratings, Absolute-Maximum Values:
At frequencies up to 5000 Mc and altitudes:

<table>
<thead>
<tr>
<th></th>
<th>Up to 5000 Mc</th>
<th>Between 80,000 and 100,000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>250 max.</td>
<td>200 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-50 max.</td>
<td>-50 max. volts</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>25 max.</td>
<td>25 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>6 max.</td>
<td>6 max. ma</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>2.5 max.</td>
<td>2.5 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>50 max.</td>
<td>50 max. volts</td>
</tr>
<tr>
<td></td>
<td>Heater negative with respect to cathode.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heater positive with respect to cathode.</td>
<td></td>
</tr>
<tr>
<td>PLATE-SEAL TEMPERATURE</td>
<td>225 max.</td>
<td>225 max. °C</td>
</tr>
</tbody>
</table>

Typical CCS¹ Operation in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th></th>
<th>At 500</th>
<th>At 1000</th>
<th>At 2000</th>
<th>At 3000</th>
<th>At 4150</th>
<th>At 5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>205</td>
<td>203</td>
<td>151</td>
<td>125</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>DC Cathode-to-Grid</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0.1</td>
<td>0.26</td>
<td>-</td>
</tr>
<tr>
<td>Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>1000</td>
<td>600</td>
<td>250</td>
<td>500</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>ohms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>21</td>
<td>24</td>
<td>24</td>
<td>20</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>ma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>0.2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>ma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>(Approx.)</td>
<td>1.6</td>
<td>1.3</td>
<td>0.5</td>
<td>0.15</td>
<td>0.1</td>
</tr>
<tr>
<td>watts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
</tr>
</tbody>
</table>

—a Indicates a change,
As amplifier

<table>
<thead>
<tr>
<th>Parameter</th>
<th>At 500 Mc</th>
<th>At 1000 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage.</td>
<td>204 volts</td>
<td>185 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage.</td>
<td>4 volts</td>
<td>10 volts</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>800 ohms</td>
<td>2000 ohms</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>21 ma</td>
<td>24 ma</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5 ma</td>
<td>5 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>0.2 watt</td>
<td>0.2 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>2.2 watts</td>
<td>1.4 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-Circuit Resistance: 0.25 max. megohm

FREQUENCY DOUBLER — Class C

Maximum CCS^1 Ratings, Absolute-Maximum Values:

At frequencies up to 2000 Mc and altitudes:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 80,000 feet</th>
<th>Between 80,000 and 100,000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>250 max. volts</td>
<td>200 max. volts</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-50 max. volts</td>
<td>-50 max. volts</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>22 max. ma</td>
<td>22 max. ma</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>6 max. ma</td>
<td>6 max. ma</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>2.5 max. watts</td>
<td>2.5 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>50 max. volts</td>
<td>50 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>50 max. volts</td>
<td>50 max. volts</td>
</tr>
<tr>
<td>PLATE-SEAL TEMPERATURE.</td>
<td>225 max. °C</td>
<td>225 max. °C</td>
</tr>
</tbody>
</table>

Typical CCS^1 Operation in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 500 Mc</th>
<th>Up to 1000 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage.</td>
<td>193 volts</td>
<td>218 volts</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage.</td>
<td>18 volts</td>
<td>18 volts</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>3600 ohms</td>
<td>3600 ohms</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>20 ma</td>
<td>21 ma</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5 ma</td>
<td>5 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>0.8 watt</td>
<td>0.8 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>1.3 watts</td>
<td>0.9 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-Circuit Resistance: 0.25 max. megohm

--- Indicates a change.
### FREQUENCY TRIPLER — Class C

#### Maximum CCS\(^1\) Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>Up to 80,000 feet</th>
<th>Between 80,000 and 100,000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>250 max.</td>
<td>200 max.</td>
</tr>
<tr>
<td>DC GRID VOLTAGE</td>
<td>-50 max.</td>
<td>-50 max.</td>
</tr>
<tr>
<td>DC CATHODE CURRENT</td>
<td>20 max.</td>
<td>20 max.</td>
</tr>
<tr>
<td>DC GRID CURRENT</td>
<td>6 max.</td>
<td>6 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>2.5 max.</td>
<td>2.5 max.</td>
</tr>
<tr>
<td>PEAK HEATER—CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with</td>
<td>50 max.</td>
<td>50 max.</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLATE—SEAL TEMPERATURE</td>
<td>225 max.</td>
<td>225 max.</td>
</tr>
</tbody>
</table>

#### Typical CCS\(^1\) Operation in Cathode-Drive Circuit:

<table>
<thead>
<tr>
<th></th>
<th>Up to 645 Mc</th>
<th>Up to 1000 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage.</td>
<td>202 volt</td>
<td>240 volt</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage.</td>
<td>27 volt</td>
<td>15 volt</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>9000 ohms</td>
<td>25000 ohms</td>
</tr>
<tr>
<td>DC Cathode Current.</td>
<td>19 ma</td>
<td>13 ma</td>
</tr>
<tr>
<td>DC Grid Current.</td>
<td>3 ma</td>
<td>6 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>0.6 watt</td>
<td>0.2 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.7 watt</td>
<td>0.4 watt</td>
</tr>
</tbody>
</table>

#### Maximum Circuit Values:

| Grid-Circuit Resistance      | 0.25 max. megaohm |

---

a Without external shield.

b Amerac, Inc., Dunham Road, Beverly, Massachusetts.

c For use with cavities.

d Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

e Jettron Products, Inc., 56 Route 10, Hanover, N.J.


g Resdel Engineering Corp., 330 South Fair Oaks Avenue, Pasadena, California. This series of cavities covers the range from 215 to 2325 Mc.

h Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.

i Continuous Commercial Service.

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**7554**

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RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N.J.
<table>
<thead>
<tr>
<th>CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heater Current.</strong></td>
</tr>
<tr>
<td>Direct Interelectrode</td>
</tr>
<tr>
<td>Capacitances:</td>
</tr>
<tr>
<td>Grid to plate</td>
</tr>
<tr>
<td>Grid to cathode</td>
</tr>
<tr>
<td>Plate to cathode</td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
</tr>
<tr>
<td>From grid to plate and cathode connected together</td>
</tr>
<tr>
<td>From plate to grid and cathode connected together</td>
</tr>
<tr>
<td>Reverse Grid Current</td>
</tr>
<tr>
<td>Emission Voltage</td>
</tr>
<tr>
<td>Amplification Factor</td>
</tr>
<tr>
<td>Transconductance</td>
</tr>
<tr>
<td>Plate Current (1)</td>
</tr>
<tr>
<td>Plate Current (2)</td>
</tr>
<tr>
<td>Power Output</td>
</tr>
<tr>
<td>Change in Power Output</td>
</tr>
</tbody>
</table>

**Note 1:** With 6.3 volts ac or dc on heater.

**Note 2:** With 60 volts dc between heater and cathode, heater negative with respect to cathode.

**Note 3:** With 60 volts dc between heater and cathode, heater positive with respect to cathode.

**Note 4:** With grid 100 volts negative with respect to plate and cathode which are connected together.

**Note 5:** With plate 300 volts negative with respect to grid and cathode which are connected together.

**Note 6:** With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.

**Note 7:** With dc voltage on grid and plate which are connected together adjusted to produce a cathode current of 30 ma., and with 5.5 volts on heater.

**Note 8:** With dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1000 µf.

**Note 9:** With dc plate voltage of 125 volts and dc grid voltage of -5 volts.

**Note 10:** In a single-tube, cathode-drive amplifier circuit operating at a frequency of approx. 550 ± 10 Mc, and with dc plate to cathode voltage of 260 volts, input-signal power of 0.2 watt, and dc grid voltage adjusted to produce a dc plate current of 20 ma.

**Note 11:** Reduce heater voltage to 5.7 volts. Change in Power-Output value from that obtained with 6.3 volts on heater will not exceed indicated value.

← Indicates a change.
Low-Pressure Voltage-Breakdown Test:
This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-cycle rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:
This test (similar to MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions: Heater voltage of 6.3 volts, dc plate supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 cycles per second at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current. . . . . . . . . . . . . . . . . . . . . . . . 300 max. ma

For conditions shown under Characteristics Range Values, Note 1.

Variable-Frequency Vibration Performance:
This test (similar to MIL-E-1D, paragraph 4.9.20.3) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for Low-Frequency Vibration Performance. The tubes are vibrated perpendicular to the major axis through a frequency range from 5 to 500 cps and back. From 5 to 50 cps, the tubes are vibrated at a constant displacement of 0.0400 ± 0.0025 inch. From 50 to 500 cps, the tubes are vibrated at a constant acceleration of 10 ± 2 g. Total time to complete a sweep cycle is 10 ± 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 150 millivolts.

Each tube is vibrated for 60 seconds at the frequency which gives maximum vibrational noise output. If, at the end of 60 seconds, the vibrational noise output is still increasing, the test is continued until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.

At the end of the test, the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Heater Current. . . . . . . . . . . . . . . . . . . . . . . . 300 max. ma

For conditions shown under Characteristics Range Values, Note 1.
Shock Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.5) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

- **Heater Current**: 300 max. ma
- For conditions shown under Characteristics Range Values, Note 1.
- **Heater-Cathode Leakage Current**: 60 max. µA
- For conditions shown under Characteristics Range Values, Notes 1, 3.
- **Low-Frequency Vibration Output**: 200 max. mv
- For conditions shown above under Low-Frequency Vibration Performance.
- **Change in Transconductance**: -20 max.
  - From initial value for conditions shown under Characteristics Range Values, Notes 1, 8.

Fatigue Vibration Test:

This test (similar to MIL-E-ID, paragraph 4.9.20.6) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (XI, YI) for 32 hours each. At the end of this test, tubes are required to meet the limits specified for the Shock Test.

Shorts and Continuity Test:

This test (similar to MIL-E-ID, paragraph 4.7.3) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in paragraph 4.7.7 of MIL-E-ID, Amendment 5.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

- **Heater Current**: 300 max. ma
  - For conditions shown under Characteristics Range Values, Note 1.

Ceramic-Seal-Fracture Test:

This test is performed on a sample lot of tubes every 90 days. With cathode- and plate-cylinder-supports spaced 15/16" ± 1/64", and with the grid flange centered between these supports, the tubes will withstand the gradual application of a force of 30 pounds, perpendicular to the axis of the tubes.
upon the grid flange, without causing fracture of the ceramic insulation.

Seel Strain Test:

This test (similar to MIL-E-1D, paragraph 4.9.6.31 is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97° C for at least 15 seconds and then immersing immediately in water at not more than 5° C for 5 seconds. After drying for 48 hours at room temperature, the tubes will meet the following test limit:

Heater Current. . . . . . . . . . . . 300 max. ma
For conditions shown under Characteristics Range Values, Note 1.

Heater-Cycling Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.71 is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles.

At the end of this test, tubes will not show permanent shorts or open circuits and are required to meet the following limits:

Heater Current. . . . . . . . . . . . 300 max. ma
For conditions shown under Characteristics Range Values, Note 1.

Heater-to-Cathode Leakage Current . . 60 max. µa
For conditions shown under Characteristics Range Values, Notes 1,3.

Grid-to-Cathode Leakage Resistance . . 50 min. megohms
For conditions shown under Characteristics Range Values, Notes 1,4.

I-Hour Stability Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions:

Heater voltage of 6.3 volts, plate supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under Characteristics Range Values, Notes 1,8.

In addition, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Heater Current. . . . . . . . . . . . 300 max. ma
For conditions shown under Characteristics Range Values, Note 1.
100-Hour Survival Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1b) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for 1-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:

- **Heater Current**: 300 max. ma
  - For conditions shown under Characteristics Range Values, Note 1.
- **Transconductance**: 9000 min. µmhos
  - For conditions shown under Characteristics Range Values, Notes 1, 8.
- **Plate Current (2)**: 50 max. µa
  - For conditions shown under Characteristics Range Values, Notes 1, 9.

500- and 1000-Hour Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high-quality RF performance. Each tube is life-tested as a class C amplifier in special cavity at 550 ± 10 Mc under the following conditions: Heater voltage of 6.3 volts; plate supply voltage of 250 volts; cathode resistor adjusted to give plate current of 25 ma.; and grid-circuit resistance adjusted to give grid current of 6 ma., heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225° C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tubes will not show permanent shorts or open circuits, and will be criticized for total number of tubes failing to pass the following limits:

- **Heater Current**: 300 max. ma
  - For conditions shown under Characteristics Range Values, Note 1.

Leakage Resistance:
- From grid to plate and cathode connected together: 60 min. megohms
- From plate to grid and cathode connected together: 60 min. megohms

At the end of 1000 hours, the tubes will not show permanent shorts or open circuits and will be criticized for total number of tubes failing to pass the following limits:

- **Heater Current**: 300 max. ma
  - For conditions shown under Characteristics Range Values, Note 1.
Power Output . . . . . . . . . . . . . . . . . . . . . . . . . . . 1.3 min. watts
For conditions shown under Characteristics Range Values,
Notes 1, 10.

OPERATING CONSIDERATIONS
Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm, large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The cathode should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum-rated values shown in the tabulated data.
REFERENCE PLANE "A" IS DEFINED AS THAT PLANE AGAINST WHICH ANNULAR SURFACE "B" OF THE GRID FLANGE ABUTS.

ANNULAR SURFACE "B" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE CATHODE CYLINDER.

ANNULAR SURFACE "C" IS ON THE SIDE OF THE GRID FLANGE TOWARD THE PLATE CYLINDER.

NOTE 1: WITH ANNULAR SURFACE "B" RESTING ON REFERENCE PLANE "A", THE AXIS OF THE CATHODE CYLINDER WILL BE WITHIN 2° OF A LINE PERPENDICULAR TO REFERENCE PLANE "A".

NOTE 2: THE AXES OF THE PLATE CYLINDER AND CATHODE CYLINDER WILL COINCIDE WITHIN 0.010".

NOTE 3: THE AXES OF THE CATHODE CYLINDER AND GRID FLANGE WILL COINCIDE WITHIN 0.005".

NOTE 4: THE DIAMETER ALONG THE 0.320" MINIMUM LENGTH IS MEASURED WITH "GO" AND "NO-GO" RING GAUGES G1-1 AND G1-2, RESPECTIVELY.

NOTE 5: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G2-1 AND G2-2, RESPECTIVELY.

NOTE 6: THIS DIAMETER IS MEASURED WITH "GO" AND "NO-GO" GAUGES G3-1 AND G3-2, RESPECTIVELY.
<table>
<thead>
<tr>
<th>Gauge</th>
<th>Type</th>
<th>Diameter A</th>
<th>Thickness B</th>
<th>Radius R</th>
</tr>
</thead>
<tbody>
<tr>
<td>G₁-1</td>
<td>GO</td>
<td>0.25200&quot;±0.00000&quot;</td>
<td>0.320&quot;±0.001&quot;</td>
<td>0.003&quot; MAX.</td>
</tr>
<tr>
<td>G₁-2</td>
<td>NO-GO</td>
<td>0.24500&quot;±0.00007&quot;</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G₂-1</td>
<td>GO</td>
<td>0.42000&quot;±0.00000&quot;</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G₂-2</td>
<td>NO-GO</td>
<td>0.40000&quot;±0.00007&quot;</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G₃-1</td>
<td>GO</td>
<td>0.55700&quot;±0.00000&quot;</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G₃-2</td>
<td>NO-GO</td>
<td>0.54700&quot;±0.00007&quot;</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CHARACTERISTICS
Cathode-Drive Service

$E_p = 6.3$ VOLTS

PLATE ($I_P$) OR GRID ($I_G$) MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CONSTANT-CURRENT CHARACTERISTICS
Cathode-Drive Service

$E_f = 6.3$ VOLTS
$\text{I}_c =$ GRID MILLIAMPERES
$\text{I}_b =$ PLATE MILLIAMPERES

CATHODE-TO-GRID VOLTS

PLATE-TO-GRID VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL POWER-OUTPUT CHARACTERISTICS
Cathode-Drive Service

$E_f = 6.3$ VOLTS
$I_k^*$ CATHODE MILLIAMPERES
INPUT FREQUENCY $(Mc) = 500$

![Graph 1](92CS-11626RI)

$E_f = 6.3$ VOLTS
$I_k^*$ CATHODE MILLIAMPERES
INPUT FREQUENCY $(Mc) = 1000$

![Graph 2](92CS-11626RI)
TYPICAL POWER-OUTPUT CHARACTERISTICS
With Variation in Heater Voltage
Cathode-Drive Service

AT 100% POWER OUTPUT:
DC PLATE-TO-GRID VOLTS = 200
DC PLATE MA. = 25

PLATE-SEAL-TEMPERATURE CHARACTERISTICS

$E_f = 6.3$ VOLTS
LUMPED-CONSTANT SOCKET.
Traveling-Wave Tube

**FREQUENCY RANGE**
1700-2300 Mc (S-Band)

**INTEGRAL PERIODIC-PERMANENT-MAGNET TYPE**

For Use as an Output Amplifier in Radio Relay Systems

### Electrical:
- **Heater, for Unipotential Cathode:**
  - Voltage (AC or DC): 6.3 ± 5% volts
  - Current at heater volts = 1.75 amp
  - Minimum Cathode Heating Time: 3 minutes
  - Frequency Range: 1700 to 2300 Mc
  - Cold Insertion Loss: 60 db
  - Thermostatic Switch:
    - Current rating:
      - At 125 volts ac: 6 amp
      - At 240 volts ac: 3 amp

### Mechanical:
- **Operating Position:** Any
- **Operating Altitude:** 10000 feet
- **Maximum Overall Length:** 20-1/2"
- **Maximum Height:** 3-7/8"
- **Maximum Width:** 3-1/8"
- **Maximum Shell Diameter:** 1-5/8"
- **Weight (Approx.):** 6-1/2 pounds

### Connectors:
- RF Input: Type N Plug (UG-18 B/U)
- RF Output: Type N Plug (UG-18 B/U)
- Terminal Leads: Spade Lugs (Amphenol No. 32419, or equivalent)

### Thermal:
- **Collector Temperature:** 225 max. °C
- **Ambient Temperature:** -30 to +70 °C
- **Air Flow into Radiator:** 25 min. cfm

### RF Power Amplifier

#### Maximum Ratings, Absolute-Maximum Values:
- **DC Collector Voltage:** 3000 max. volts
- **DC Helix Voltage:** 2500 max. volts
- **DC Grid-No.2 Voltage:** 1700 max. volts
- **DC Collector Current:** 80 max. ma
- **DC Helix Current:** 3 max. ma
- **DC Grid-No.2 Current:** 0.2 max. ma
- **RF Power Input:** 5 max. watts

#### Typical Operation at 2000 Mc:
- **DC Collector Voltage:** 2000 volts
- **DC Helix Voltage:** 2250 volts
DC Grid-No.2 Voltage: 1450 volts
DC Collector Current: 70 ma
DC Helix Current: 0.8 ma
DC Grid-No.2 Current: 0.1 ma
Input VSWR: 1.2:1
Output VSWR: 1.4:1
RF Power Input: 30 mw
Saturated Power Output: 20 watts

**CHARACTERISTICS RANGE VALUES**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>DC Collector Voltage</td>
<td>2,3</td>
<td>1650</td>
</tr>
<tr>
<td>DC Helix Voltage</td>
<td>3</td>
<td>1900</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>3</td>
<td>1150</td>
</tr>
<tr>
<td>DC Collector Current</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>DC Helix Current</td>
<td>3</td>
<td>1.1</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td>Input VSWR</td>
<td>-</td>
<td>1.4:1</td>
</tr>
<tr>
<td>Output VSWR</td>
<td>-</td>
<td>1.5:1</td>
</tr>
<tr>
<td>Saturated Power Output</td>
<td>-</td>
<td>18</td>
</tr>
</tbody>
</table>

**Notes:**

1. With heater volts = 6.3.
2. Normally the collector voltage is 250 volts below the helix voltage, but may be equal to the helix voltage or any value between these points.
3. Specific operating value is supplied with each tube.

**OPERATING CONSIDERATIONS**

The magnetic field required to focus the electron beam in the 7642 is supplied by integral periodic permanent magnets. Although the periodic-magnet structure is difficult to demagnetize and has little stray field, care should be taken to prevent the presence of any appreciable external transverse magnetic field which might cause defocusing of the electron beam within the tube. Magnetic material should be kept at least eight inches away from the tube.

Impedance match between the 7642 rf power output and the load should have a voltage standing wave ratio (VSWR) no greater than 2:1. With VSWR's in excess of this value, oscillations may occur causing permanent damage to the tube. Tubes should not be operated without a termination.

Forced-air cooling of the collector is necessary whenever collector current is flowing. Failure to observe this precaution may result in permanent damage to the tube. It is recommended that the forced-air cooling be applied when the heater power is applied.

A thermostatic switch is mounted on the collector of the 7642 which opens when the collector temperature exceeds 225°C.
a safe limit. It is recommended that the thermostatic switch be used in an interlock circuit in the power supply for the collector, helix, and grid-No.2 voltages. The thermostatic switch will carry 6 amperes at 125 volts ac or 3 amperes at 240 volts ac.

The power supply should incorporate a helix-current overload protective device to prevent damage to the tube in the event of loss of collector voltage. Such a condition would cause the entire electron beam current to flow to the helix and thereby overheat that electrode. If it is desired to remove all voltages by a single control, the time-constant values of the power supply should be chosen so that the helix voltage decays faster than the collector voltage.

As the grid-No.2 voltage increases from zero to the operating value, the helix current may reach as high as 10 ma in the vicinity of 200 to 600 volts on grid No.2, then will fall below 2 ma at the proper operating grid-No.2 voltage. The helix supply should have adequate regulation to handle this transient during the turn-on procedure. In order to protect the tube, the helix supply should also have an interlock to open the circuit if the helix current exceeds 3 ma longer than a few milliseconds.

Mounting. The 7642 may be mounted in any position by means of bolts through either set of holes in the two mounting blocks.

Electrical connections are made to the 7642 by means of the seven leads with spade type lugs. These color-coded, flexible, insulated leads are identified on the Dimensional Outline. RF input and output connections are made to type N plugs (UG-18 B/U) on the tube (see Dimensional Outline). The collector is connected to the capsule and is normally grounded.

The rated values for collector voltage, helix voltage, and grid-No.2 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at a high dc potential.

STARTING PROCEDURE

Voltages should be applied to the 7642 in the following sequence: Apply the heater voltage and allow tube to warm-up for 3 minutes minimum. Then apply the collector voltage as specified on the tube label. Next, apply the helix voltage as specified on the tube label. Finally, increase the grid-No.2 voltage in a few milliseconds to obtain the collector current specified on the tube label. The three power supplies can be controlled by one switch provided there is a sufficient delay in application of the grid-No.2 voltage to allow the collector and helix voltages to stabilize first.

TURN-OFF PROCEDURE

To turn off the tube, remove the electrode voltages in the following sequence. First reduce the grid-No.2 voltage, then remove the helix voltage, collector voltage, and heater voltage.
in that order. The three power supplies can be controlled by one switch provided the grid-No.2 voltage decays faster than the collector and helix voltages.

**Dimensions in Inches**

**Color Code of Leads**

- **HEATER** . . . . . . . . . . . . . Brown
- **HEATER, CATHODE, GRID No.1** . . . . Yellow
- **HELIX** . . . . . . . . . . . . . Orange
- **GRID No.2** . . . . . . . . . . . Blue
- **COLLECTOR, SHELL** . . . . . . Black
- **THERMOSTATIC SWITCH (2)** . . . . White

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices  Harrison, N. J.
Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN
FORCED-AIR COOLED
1250-WATTS CW INPUT UP TO 1215 Mc
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE
For Use under Severe Shock and Vibration

GENERAL DATA

Electrical:
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:
Voltage (AC or DC)* 6.3 ± 10% volts
Current at heater volts = 6.3 7.85 amp
Minimum heating time 120 sec
Mu-Factor, Grid No.2 to Grid No.1
for plate volts = 225, grid-No.2 volts = 225, and plate ma. = 100. 13
Direct Interelectrode Capacitances:
Grid No.1 to plate 0.11 max. µf
Grid No.1 to cathode & heater 29 µf
Plate to cathode & heater 0.011 max. µf
Grid No.1 to grid No.2 37 µf
Grid No.2 to plate 8.3 µf
Grid No.2 to cathode & heater 1.1 max. µf

Mechanical:
Operating Position Any
Overall Length 2.34" ± 0.06"
Greatest Diameter (See Dimensional Outline) 2.06" ± 0.03"
Weight (Approx.) 3/4 lb
Radiator Integral part of tube
Terminal Connections (See Dimensional Outline):

Air Flow:
Air flow may be removed simultaneously with all voltages.
Through radiator—Adequate air flow to limit the plate-core temperature to 250°C should be delivered by a blower through the radiator during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values

Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
of air flow directed through the radiator to maintain the plate core (See Dimensional Outline) at 250° C with an incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

<table>
<thead>
<tr>
<th>Plate Dissipation (watts)</th>
<th>Air Flow (cubic ft/min)</th>
<th>Static Pressure (inches of water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>300</td>
<td>4</td>
<td>0.14</td>
</tr>
<tr>
<td>600</td>
<td>11</td>
<td>0.66</td>
</tr>
<tr>
<td>700</td>
<td>16</td>
<td>0.96</td>
</tr>
</tbody>
</table>

To grid-No. 2, grid-No. 1, cathode, and heater terminals—A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during stand-by (heater only) operation.

Plate-Core Temperature .............................. 250 max. °C
Terminal Temperature (Plate, Grid No.2, Grid No.1, Cathode, and Heater) .................. 250 max. °C

AF POWER AMPLIFIER & MODULATOR

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>3000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENTd</td>
<td>500 max. ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.1 CURRENTd</td>
<td>100 max. ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUTd</td>
<td>1500 max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUTd</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATIONd</td>
<td>600 max. watts</td>
</tr>
</tbody>
</table>

Typical CCS Push-Pull Operation:

Values are for 2 tubes

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2700 3000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>450 450 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-40 -40 volts</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-Grid-No.1 Voltage</td>
<td>80 80 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>200 200 ma</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current.</td>
<td>900 1000 ma</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current.</td>
<td>0 0 ma</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current.</td>
<td>6 9 ma</td>
</tr>
<tr>
<td>Effective Load Resistance (Plate to plate)</td>
<td>6000 6400 ohms</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0 0 watts</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>1400 1600 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition:

With fixed bias ................................. 15000 max. ohms
With cathode bias ................................ Not recommended
LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>2500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT.</td>
<td>500 max. ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID-No.1 CURRENT.</td>
<td>100 max. ma</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT.</td>
<td>1250 max. watts</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT.</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>600 max. watts</td>
</tr>
</tbody>
</table>

Typical CCS "Single-Tone" Operation:

In grid-drive circuit at 30 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2250 2500 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>450 450 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-37 -37 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>160 160 ma</td>
</tr>
<tr>
<td>Zero-Signal DC Grid-No.2 Current.</td>
<td>0 0 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance.</td>
<td>2500 2700 ohms</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current.</td>
<td>450 500 ma</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2 Current.</td>
<td>4 4 ma</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.1 Current.</td>
<td>0.05 0.05 ma</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 90 %</td>
</tr>
<tr>
<td>Max.-Signal Driver Power Output (Approx.)</td>
<td>1 1 watt</td>
</tr>
<tr>
<td>Max.-Signal Useful Power Output (Approx.)</td>
<td>580J 680J watts</td>
</tr>
</tbody>
</table>

Typical CCS Operation with "Two-Tone Modulation"k

In grid-drive circuit at 30 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2250 2500 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>450 450 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-37 -37 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>160 160 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance.</td>
<td>2500 2700 ohms</td>
</tr>
<tr>
<td>DC Plate Current at peak of envelope.</td>
<td>450 500 ma</td>
</tr>
<tr>
<td>Average DC Plate Current.</td>
<td>315 350 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at peak of envelope</td>
<td>3 4 ma</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current.</td>
<td>1.8 2.5 ma</td>
</tr>
<tr>
<td>Average DC Grid-No.1 Current.</td>
<td>0.005 0.05 ma</td>
</tr>
<tr>
<td>Peak-Envelope Driver Power (Approx.)</td>
<td>1 1 watt</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 90 %</td>
</tr>
<tr>
<td>Distortion Products Level:</td>
<td></td>
</tr>
<tr>
<td>Third Order</td>
<td>-31 -31 db</td>
</tr>
<tr>
<td>Fifth Order</td>
<td>-36 -36 db</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td>230 340 watts</td>
</tr>
<tr>
<td>Peak Envelope</td>
<td>580J 680J watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance under any condition:</td>
<td>15000 max. ohms</td>
</tr>
<tr>
<td>For fixed-bias operation.</td>
<td>Not recommended</td>
</tr>
<tr>
<td>For cathode-bias operation.</td>
<td></td>
</tr>
</tbody>
</table>

*radiocorporation of america* data 9-62
PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

Maximum CCS\(^c\) Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute-Maximum Values up to 1215 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>2000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE.</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE.</td>
<td>-250 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT.</td>
<td>500 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT.</td>
<td>1000 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT.</td>
<td>17 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION.</td>
<td>400 max. watts</td>
</tr>
</tbody>
</table>

Typical CCS Operation:

In cathode-drive circuit at 400 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>1800 2000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage.</td>
<td>400 400 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage.</td>
<td>-45 -35 volts</td>
</tr>
<tr>
<td>DC Plate Current.</td>
<td>450 500 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current.</td>
<td>8 8 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>15 12 ma</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>80 80 %</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>35 35 watts</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>500 600 watts</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition 15000 max. ohms

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

and

RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS\(^c\) Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute-Maximum Values up to 1215 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>2500 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE.</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE.</td>
<td>-250 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT.</td>
<td>500 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT.</td>
<td>1250 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT.</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION.</td>
<td>700 max. watts</td>
</tr>
</tbody>
</table>

Typical CCS Operation:

In cathode-drive circuit at 400 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>2250 2500 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage.</td>
<td>400 400 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage.</td>
<td>-45 -35 volts</td>
</tr>
<tr>
<td>DC Plate Current.</td>
<td>450 500 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current.</td>
<td>7 8 ma</td>
</tr>
</tbody>
</table>
DC Grid-No.1 Current (Approx.) 10-12 ma
Output-Circuit Efficiency (Approx.) 80%
Driver Power Output (Approx.) 30-35 watts
Useful Power Output (Approx.) 650-800 watts

In cathode-drive circuit at 225 Hz:
DC Plate Voltage 2500 volts
DC Grid-No.2 Voltage 400 volts
DC Grid-No.1 Voltage -50 volts
DC Plate Current 500 ma
DC Grid-No.2 Current 6 ma
DC Grid-No.1 Current (Approx.) 10 ma
Output-Circuit Efficiency (Approx.) 70%
Driver Power Output (Approx.) 80 watts
Useful Power Output (Approx.) 375 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance under any condition:
For fixed-bias operation 15000 max. ohms
For cathode-bias operation Not recommended

Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and thereby prevent overheating the cathode and resultant short life.

* Single-Tone operation refers to that class of amplifier service in which the grid-No.1 input consists of a monofrequency rf signal having constant amplitude. This signal is produced in a single-sideband suppressed-carrier system when a single audio frequency of constant amplitude is applied to the input of the system.

This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

Driver power output represents circuit losses and is actual power measured at the input to grid-No.1 circuit used. The tube driving power is zero watts.

This value of useful power is measured in load of output circuit.

* Two-Tone-Modulation operation refers to that class of amplifier service in which the input consists of two monofrequency rf signals having equal peak amplitude.

With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

Cathode is at dc ground potential.

Obtained preferably from a separate source modulated along with the plate supply.

Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

Driver power output includes circuit losses and feed-through power. It is the actual power measured at input to drive circuit.

Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

Obtained preferably from a fixed supply, or from the plate supply voltage with a voltage divider.
Heater Current: "1 7.4 8.3 amp"

Direct Interelectrode Capacitances:
- Grid No.1 to plate: 2 0.11 µf
- Grid No.1 to cathode & heater: 2 26 32 µf
- Plate to cathode & heater: 2 0.011 µf
- Grid No.1 to grid No.2: 2 34 41 µf
- Grid No.2 to plate: 2 4.3 6.3 µf
- Grid No.2 to cathode & heater: 2 1.1 µf

Reverse Grid-No.1 Current: 1.3 -50 µa
Peak Emission Current: 1.4 -80 - amp
Interelectrode Leakage Resistance: Grid-No.1 Cutoff Voltage: 1.6 -87 volts

**Note 1:** With 6.3 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With dc plate voltage of 2000 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 200 ma.

**Note 4:** For conditions with 6.3 volts on heater: grid No.1, grid No.2 and plate tied together; and pulse-voltage source of 850 peak volts connected between plate and cathode. Pulse duration is 2 microseconds, pulse-repetition frequency is 60pps, and duty factor is 0.00012. Read peak emission current after 1 minute.

**Note 5:** Under conditions 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 electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.

**Note 6:** With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

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**SPECIAL TESTS & PERFORMANCE DATA**

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N.J., on request.

**50-g, 11-Millisecond Shock Test:**

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

**500-g, Nominal 3/4-Millisecond Shock Test:**

This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions.

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RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N.J.
positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:
This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply-voltage of 300 volts, dc grid-No.2 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms, the tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

a. 5-to-10 cps with fixed double amplitude of 0.080 inch ± 10%.

b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.

c. 15-to-105 cps with fixed double amplitude of 0.036 inch ± 10%.

d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

OPERATING CONSIDERATIONS
A suggested mounting arrangement for the 7650 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

NOTE 2: THE DIAMETER OF EACH TERMINAL IS HELD TO INDICATED VALUES ONLY OVER THE INDICATED MINIMUM LENGTH OF ITS CONTACT SURFACE.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES. DIAMETERS OF STIPPLED AREAS ABOVE AIR-COOLED RADIATOR, PLATE-TERMINAL CONTACT SURFACE, AND GRID-NO.2-TERMINAL CONTACT SURFACE SHALL NOT BE GREATER THAN ITS ASSOCIATED DIAMETER.
SKETCH Q₁

SURFACE A-A' IS FLAT WITHIN 0.0005" PEAK TO VALLEY AND IS PERPENDICULAR TO THE AXIS OF THE CYLINDRICAL HOLES WITHIN 0.00025".

THE AXES OF THE CYLINDRICAL HOLES H₁ THROUGH H₅ AND THE AXIS OF POST P ARE COINCIDENT WITHIN 0.001".
SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

SEE DETAIL "A"

TOLERANCES ±.005" UNLESS OTHERWISE SPECIFIED.

CONTACT STRIP MADE BY INSTRUMENT SPECIALTIES CO., LITTLE FALLS, N.J.

92CM-10503
TYPICAL CHARACTERISTICS

$E_C = 6.3\ \text{VOLTS}$

GRID-$N^2 2\ \text{VOLTS} = 400$

--- $I_C_1$

--- $I_C_2$

GRID-$N^1\ \text{VOLTS} E_C = \pm 20$

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

$E_f = 6.3\ \text{VOLTS}$
GRID-$N^2$ 2 VOLTS = 300
$IC_2 = $ GRID-$N^2$ 2 MA,
$IC_1 = $ GRID-$N^2$ 1 MA.

GRID-$N^2$ 1 VOLTS

PLATE VOLTS

PLATE MA

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

$E_F = 6.3$ VOLTS
GRID—NR2 VOLTS = 400
IC$_1$ = GRID—NR1 MA.
IC$_2$ = GRID NR2 MA.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN
COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR
FORCED-AIR COOLED
27-KW PEAK-PULSE POWER INPUT UP TO 1215 Mc
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use under Severe Shock and Vibration

**GENERAL DATA**

**Electrical:**
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:
- Voltage (AC or DC) ........................................... 6.3 ± 10% volts
- Current at heater volts = 6.3 ............................ 7.5 amp
- Minimum heating time ...................................... 120 sec
- Mu-Factor, Grid No.2 to Grid No.1
  - for plate volts = 225, grid-No.2 volts = 225, and plate ma. = 100 .... 13
- Direct Interelectrode Capacitances:
  - Grid No.1 to plate ........................................ 0.13 max. µµf
  - Grid No.1 to cathode & heater ......................... 29 µµf
  - Plate to cathode & heater .............................. 0.01 max. µµf
  - Grid No.1 to grid No.2 ................................ 38 µµf
  - Grid No.2 to plate ........................................ 6.5 µµf
  - Grid No.2 to cathode & heater ....................... 0.8 max. µµf

**Mechanical:**
Operating Position ........................................... Any
Overall Length .................................................. 2.34" ± 0.06"
Greatest Diameter (See Dimensional Outline) ................. 2.06" ± 0.03"
Weight (Approx.) ............................................. 3/4 lb
Radiator ......................................................... Integral part of tube
Terminal Connections (See Dimensional Outline):

- G1-Grid-No.1-
  - Terminal
  - Contact
  - Surface
- G2-Grid-No.2-
  - Terminal
  - Contact
  - Surface
- H-Heater-
  - Terminal
  - Contact
  - Surface

**Air Flow:**
Air flow may be removed simultaneously with all voltages.

Through radiator—Adequate air flow to limit the plate-core temperature to 250°C should be delivered by a blower through the radiator during the application of heater, plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator to maintain the
Incoming air temperature of 25° C and with no restrictions at the plate-contact flange are:

<table>
<thead>
<tr>
<th>Plate Dissipation (watts)</th>
<th>Air Flow (cubic ft/min)</th>
<th>Static Pressure (inches of water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>300</td>
<td>4</td>
<td>0.14</td>
</tr>
<tr>
<td>600</td>
<td>11</td>
<td>0.66</td>
</tr>
</tbody>
</table>

To Grid-No. 2, Grid-No. 1, Cathode, and Heater Terminals—
A sufficient quantity of air should be directed at the heater terminal and allowed to flow past each of these terminals so that no terminal temperature exceeds the specified maximum value of 250° C. An air flow of 2.5 cfm is usually adequate. Forced-air cooling of heater and cathode terminals is usually required during standby (heater only) operation.

Plate-Core Temperature. .................................. 250 max. °C
Terminal Temperature (Plate, Grid No. 2,
Grid No. 1, Cathode, and Heater) ............... 250 max. °C

GRID-PULSED RF AMPLIFIER
and
GRID-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCS Ratings, Absolute-Maximum Values:

For maximum "on" time of 10 microseconds

<table>
<thead>
<tr>
<th></th>
<th>Up to 1215 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>5000 max. volts</td>
</tr>
<tr>
<td>DC GRID-No. 2 VOLTAGE.</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No. 1 VOLTAGE.</td>
<td>-250 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT DURING PULSE</td>
<td>9 max. amp</td>
</tr>
<tr>
<td>DC PLATE CURRENT.</td>
<td>0.5 max. amp</td>
</tr>
<tr>
<td>GRID-No. 2 INPUT (Average)</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>GRID-No. 1 INPUT (Average)</td>
<td>10 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION (Average)</td>
<td>600 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation:

In grid-pulsed cathode-driven circuit with rectangular-wave pulse at 1215 Mc and with duty factor of 0.01

| DC Plate Voltage.        | 3600 4000 volts        |
| Peak-Positive Grid-No. 2 Voltage | 800 1000 volts       |
| DC Grid-No. 1 Voltage.   | -100 -120 volts        |
| DC Plate Current during pulse | 8 9 amp            |
| DC Plate Current.        | 0.19 0.2 amp           |
| DC Grid-No. 2 Current.   | 0.005 0.006 amp        |
| DC Grid-No. 1 Current.   | 0.02 0.02 amp          |
| Output-Circuit Efficiency (Approx.) | 80 80 %            |

Driver Power Output at peak
do pulse (Approx.) f .................................. 5.2 6.3 kw
Useful Power Output at peak
do pulse (Approx.) ................................ 159 208 kw

indicating a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
In grid-and-screen-pulsed cathode-drive circuit with rectangular-wave pulses at 1215 Mc with duty factor \( \approx \) 0.01

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>3600, 4000 volts</td>
</tr>
<tr>
<td>Peak Positive-Pulse Grid-No.2 Voltage</td>
<td>800, 1000 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>0, 0 volts</td>
</tr>
<tr>
<td>DC Plate Current during pulse</td>
<td>8, 9 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.145, 0.165 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.003, 0.006 amp</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>80, 90 %</td>
</tr>
</tbody>
</table>

Driver Power Output at peak of pulse (Approx.) \( \approx \) 2.4, 2.9 kw

Useful Power Output at peak of pulse (Approx.) \( \approx \) 11, 15 kw

---

PLATE-AND-SCREEN-PULSED RF AMPLIFIER

Maximum CCsb Ratings, Absolute-Maximum Values:

For maximum "on" time \( \approx \) of 10 microseconds

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAK POSITIVE-PULSE PLATE VOLTAGE</td>
<td>8000 max. volts</td>
</tr>
<tr>
<td>PEAK POSITIVE-PULSE GRID-No.2 VOLTAGE</td>
<td>1200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-250 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT DURING PULSE</td>
<td>9 max. amp</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>0.12 max. amp</td>
</tr>
<tr>
<td>GRID-No.2 INPUT (Average)</td>
<td>25 max. watts</td>
</tr>
<tr>
<td>GRID-No.1 INPUT (Average)</td>
<td>10 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION (Average)</td>
<td>600 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation:

In cathode-drive circuit with rectangular-wave pulses at 1215 Mc and with duty factor \( \approx \) 0.01

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>7200, 8000, 7200, 8000 volts</td>
</tr>
<tr>
<td>Peak Positive-Pulse Grid-No.2 Voltage</td>
<td>800, 1000, 800, 1000 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>0, 0, -75, -60 volts</td>
</tr>
<tr>
<td>DC Plate Current during pulse</td>
<td>8, 9, 8, 9 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>0.09, 0.1, 0.09, 0.1 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0.003, 0.008, 0.003, 0.004 amp</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>80, 90, 80, 90 %</td>
</tr>
<tr>
<td>Driver Power Output at peak of pulse (Approx.)</td>
<td>1.8, 2.2, 4.5, 5.3 kw</td>
</tr>
<tr>
<td>Useful Power Output at peak of pulse (Approx.)</td>
<td>22, 26, 30, 39 kw</td>
</tr>
</tbody>
</table>

\( a \) Measured with special shield adapter.

\( b \) Continuous Commercial Service.

"On" time is defined as the sum of the durations of all the individual pulses which occur during any 1000-microsecond interval. An increase in...
dc plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times.

Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

d Cathode is at dc ground potential.

- Duty factor is defined as the ratio of "on" time to total elapsed time in any 1000-microsecond interval.

f Driver power output includes circuit losses and feed-through power.

It is actual power measured at input to tube drive circuit. It will vary with frequency of operation and driver circuitry.

This value of useful power is measured in load of output circuit.

**Characteristics Range Values for Equipment Design**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td></td>
<td>1</td>
<td>8.3</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td></td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
<td></td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td></td>
<td>35</td>
<td>42</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td></td>
<td>5.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
<td></td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Reverse Grid-No.1 Current</td>
<td></td>
<td>1.3</td>
<td>-50</td>
</tr>
<tr>
<td>Peak Emission Voltage</td>
<td></td>
<td>1.4</td>
<td>850</td>
</tr>
<tr>
<td>Interelectrode Leakage Resistance</td>
<td>5</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Grid-No.1 Cutoff Voltage</td>
<td>1.6</td>
<td>-</td>
<td>170</td>
</tr>
</tbody>
</table>

**Note 1:** With 6.3 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 200 ma.

**Note 4:** For conditions with 6.3 volts on heater; grid No.1, grid No.2, and plate tied together; and pulse-voltage source connected between plate 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 80 amperes is obtained. After 1 minute at this value, the voltage-pulse amplitude will not exceed 850 volts (peak).

**Note 5:** Under conditions 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 electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 8 megohms.

**Note 6:** With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and a dc grid-No.1 voltage adjusted to give a dc plate current of 5 ma.

**Special Tests & Performance Data**

Resonances in the tube mountings used in the following tests can cause the specified environmental conditions to produce greatly amplified effects. Extreme care must, therefore, be used in the design of the mountings to minimize resonances. Design details of mountings used by the RCA Electron Tube Division to perform these tests may be obtained from RCA Commercial Engineering, Harrison, N. J., on request.

Indicates a change.
50-g, 11-Millisecond Shock Test:
This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified long-duration impact acceleration. Tubes are held rigid in six different positions in a Medium-Impact Shock Machine and are subjected to three blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

500-g, Nominal 3/4-Millisecond Shock Test:
This test is performed on sample lots of tubes to determine the ability of the tube to withstand the specified impact acceleration. Tubes are held rigid in four different positions in a High-Impact Shock Machine and are subjected to five blows in each position. At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

5-to-2000 cps Vibration Test:
This test is performed on sample lots of tubes to determine the ability of the tube to withstand variable-frequency vibration. With heater voltage of 6.3 volts ac or dc, dc plate supply voltage of 300 volts, dc grid-No.2 voltage adjusted to give dc plate current of 10 ma., and plate load resistor of 2000 ohms. The tube is vibrated along each of three mutually perpendicular axes over an 8-minute cycle consisting of:

a. 5-to-10 cps with fixed double amplitude of 0.08 inch ± 10%.
b. 10-to-15 cps at fixed acceleration of 0.41 g ± 10%.
c. 15-to-105 cps with fixed double amplitude of 0.036 inch ± 10%.
d. 105-to-2000 cps at fixed acceleration of 20 g ± 10%.

At the end of this test, tubes will not show permanent or temporary shorts or open circuits.

OPERATING CONSIDERATIONS
A suggested mounting arrangement for the 7651 is shown in the accompanying drawing along with a layout of the associated contacts. Flexible connectors are required for the plate, grid-No.2, grid-No.1, cathode, and heater contact surfaces.

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

--- indicates a change.
DIMENSIONAL OUTLINE, GAUGE DRAWING, and SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS shown under Type 7650 also apply to the 7651
TYPICAL PLATE CHARACTERISTICS

$E_f = 6.3$ VOLTS
GRID-N$^2$ 2 VOLTS = 1000

PLATE AMPERES

0 10 20 30 40

0 1000 2000 3000 4000 5000 6000 7000 8000
PLATE VOLTS

$E_C = 0$ +50 +100 +200 +250 $E_C = 0$ +50

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

$E_p = 6.3$ VOLTS
GRID-No. 2 VOLTS $= 800$

$- = I C_2$
$- - - = I C_1$

GRID-No.1 VOLTS $E C_1 = +150$

$E C_1 = +300$

+250

+200

+100

+50

$E C_1 = +50$

0 +50 +100

1000 2000 3000 4000

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

$E_f = 6.3$ VOLTS
GRID-N#2 VOLTS = 1000

GRID-N#1 VOLTS $E_C = +200$

GRID-N#1 (I_C1) OR GRID-N#2 (I_C2) AMPERES

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

$E_g = 6.3$ VOLTS
GRID-N$\#2$ VOLTS = 1000

$IC_1 =$ GRID-N$\#1$ AMPERES
$IC_2 =$ GRID-N$\#2$ AMPERES

GRID-N$\#1$ VOLTS

92CM-10489RI

RADIO CORPORATION OF AMERICA
Electron Tube Division  Harrison, N. J.
Beam Power Tube

CERAMIC-METAL SEALS 52.5-WATTS CW INPUT
"ONE-PIECE" ELECTRODE DESIGN 27-WATTS CW OUTPUT AT 400 Mc
CONDUCTION COOLED 15-WATTS CW OUTPUT AT 1200 Mc
COAXIAL-ELECTRODE STRUCTURE 3.2-WATTS CW OUTPUT AT 3000 Mc

UNIPOTENTIAL CATHODE

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
Voltage (AC or DC) \( \pm 10\% \) volts
Current at 12.6 volts: 0.5 amp
Minimum heating time: 40 sec

Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 35. 30

Direct Inter electrode Capacitances:
- Grid No.1 to plate: 0.025 max. \( \mu\mu f \)
- Grid No.1 to cathode & heater: 9.5 \( \mu\mu f \)
- Plate to cathode & heater: 0.004 max. \( \mu\mu f \)
- Grid No.1 to grid No.2: 17 \( \mu\mu f \)
- Grid No.2 to plate: 2.2 \( \mu\mu f \)
- Grid No.2 to cathode & heater: 0.18 max. \( \mu\mu f \)

Mechanical:
Operating Position: Any
Maximum Overall Length: 1.195"
Greatest Diameter (See Dimensional Outline): 0.740"
Weight (Approx.): 0.5 oz

Terminal Connections (See Dimensional Outline):
- \( G_1 \)-Grid-No.1-Terminal Contact Surface
- \( G_2 \)-Grid-No.2-Terminal Contact Surface
- \( H \)-Heater-Terminal Contact Surface
- \( K \)-Cathode-Terminal Contact Surface
- \( P \)-Plate-Terminal Contact Surface

Thermal:
Terminal Temperature (Plate, grid No.2, grid No.1, cathode, and heater): 250 max. \( ^\circ C \)

Cooling, Conduction:
The plate terminal must be thermally coupled to a constant-temperature device (heat sink—solid or liquid) to limit the plate terminal to the specified maximum value of 250\(^\circ\) C. The grid-No.2, grid-No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250\(^\circ\) C.
Maximum CCCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>750 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>250 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>70 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>15 max. ma</td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>52.5 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>2 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td></td>
</tr>
</tbody>
</table>

Typical CCCS Operation in Cathode-Drive Circuit:

Shown Graphically in the following three Charts 92CS-10945, -10944, and -10943.

<table>
<thead>
<tr>
<th>HEATER VOLTS</th>
<th>DC PLATE VOLTS</th>
<th>DC GRID-No.2 VOLTS</th>
<th>DC PLATE MILLIAMPERES</th>
<th>DRIVER POWER OUTPUT WATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.6</td>
<td>650</td>
<td>225</td>
<td>65</td>
<td>0.05</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.
PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1

<table>
<thead>
<tr>
<th>Maximum CCS Ratings, Absolute-Maximum Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE.</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE.</td>
</tr>
<tr>
<td>DC PLATE CURRENT.</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT.</td>
</tr>
<tr>
<td>PLATE INPUT.</td>
</tr>
<tr>
<td>GRID-No.2 INPUT.</td>
</tr>
<tr>
<td>PLATE DISSIPATION.</td>
</tr>
</tbody>
</table>

Typical CCS Operation in Cathode-Drive Circuit:

Shown Graphically in the following Chart 99CS-10949

AF POWER AMPLIFIER & MODULATOR

and

LINEAR RF POWER AMPLIFIER

Single-Sideband Suppressed-Carrier Service

<table>
<thead>
<tr>
<th>Maximum CCS Ratings, Absolute-Maximum Values:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE.</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT*</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID-No.1 CURRENT*</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT*</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
MAX.-SIGNAL GRID-No.2 INPUT* ........... 2 max. watts
PLATE DISSIPATION* .................. ..........................

RF POWER AMPLIFIER — Class B Telephony

Maximum CCS Ratings, Absolute-Maximum Values:

- DC PLATE VOLTAGE .................. 750 max. volts
- DC GRID-No.2 VOLTAGE .............. 250 max. volts
- DC PLATE CURRENT .................. 35 max. ma
- DC GRID-No.1 CURRENT .............. 8 max. ma
- PLATE INPUT .......................... 52.5 max. watts
- GRID-No.2 INPUT ..................... 2 max. watts
- PLATE DISSIPATION ................... ..........................

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition .................. 30000 max. ohms

- Because the cathode is subjected to considerable back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should be reduced depending on operating conditions and frequency to prevent overheating the cathode and resultant short life.
- Measured with special shield adapter.
- Continuous Commercial Service.
- Maximum plate dissipation is a function of the maximum plate input, efficiency of the class of service, and the effectiveness of the cooling system. See Cooling, Conduction under General Data, and also Cooling Considerations.
- Averaged over any audio-frequency cycle of sine-wave form for AP Power Amplifier & Modulator Service.
- If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td></td>
<td>0.44</td>
<td>0.54</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Grid No.1 to plate.            | 1    | 2    | 0.025 | 2.125
| Grid No.1 to cathode & heater  | 2    | -    | 0.025 | 2.125
| Plate to cathode & heater      | 2    | 8.5  | 10.3 |
| Grid No.1 to grid No.2         | 2    | 14   | 20.6 |
| Grid No.2 to plate.            | 2    | 2.1  | 2.5  |
| Grid No.2 to cathode & heater  | 2    | -    | 0.18 |
| Grid-No.1 Voltage              | 1.3  | -1   | -10  |
| Grid-No.1 Cutoff Voltage       | 1.4  | -    | -25  |
| Grid-No.2 Current              | 1.3  | -3   | 2    |
| Positive Grid-No.1 Voltage     | 1.5  | 0    | 14   |
| Transconductance               | 1.6  | 7500 | -    |

Note 1: With 12.6 volts ac or dc on heater.
Note 2: Measured with special shield adapter.
Note 3: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 280 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.
Note 4: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 3
5-61
Note 5: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage of -100 volts. Rectangular pulses, pulse duration of 4500 to 5000 microseconds and pulse-repetition frequency of 10 to 12 pps. The positive-pulse grid-No.1 voltage is adjusted to give a plate current of 300 ma. at leading edge of pulse.

Note 6: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 150 volts, dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

COOLING CONSIDERATIONS

The conduction-cooling system consists, in general, of a constant-temperature device (heat sink) and suitable heat-flow path (coupling) between the heat sink and tube. Careful consideration should be given to the design of a heat-flow path through a coupling device having high thermal conductivity.

Thermal conductivity may be calculated from the equation:

\[ K = \frac{W}{A \left( \frac{T_2 - T_1}{L} \right)} \]  

where:
- \( K \) = thermal conductivity of the material
- \( W \) = power transfer in watts
- \( A \) = area measured at right angles to the direction of the flow of heat in square inches
- \( T_1, T_2 \) = temperature in degrees Centigrade of planes or surfaces under consideration
- \( L \) = length of heat path in inches through coupling material to produce temperature gradient

Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 1° C.

For a given system Equation (1) must be integrated to consider changes in area \( (A) \) dependent on the coupling configuration and changes in thermal conductivity \( (K) \) dependent on various coupling materials and interfaces. Equation (1) may now be reduced to the following:

\[ K_S = \frac{W_p}{T_2 - T_1} \]  

where:
- \( K_S \) = thermal conductance of the system
- \( W_p \) = maximum permissible plate dissipation in watts
- \( T_2 \) = temperature in degrees Centigrade at tube terminal
- \( T_1 \) = temperature in degrees Centigrade of heat sink
NOTE 1: WITH THE CYLINDRICAL SURFACES OF THE GRID-No.2 TERMINAL, GRID-No.1 TERMINAL, HEATER-CATHODE TERMINAL, AND CENTERING PIN CLEAN, SMOOTH, AND FREE OF BURRS, THE TUBE WILL ENTER A GAUGE AS SHOWN IN SKETCH G1.

NOTE 2: WITH THE TUBE SEATED IN GAUGE AND WITH THE PLATE TERMINAL CLEAN, SMOOTH, AND FREE OF BURRS, THE GAUGE RING WILL SLIP OVER PLATE TERMINAL SHOWN IN SKETCH G1 AND NOT EXTEND ABOVE GAUGE. THE TUBE WILL ROTATE 360° FREELY AND WILL NOT EXTEND ABOVE GAUGE RING.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.
SKETCH 81

GAUGE RING

.2530 ± .005 R

.525 ± .001

.002 MAX. CLEARANCE

.25

.430 ± .001

.430 ± .001

.207 ± .001

.112 ± .001

.240 ± .001

.3700 ± .0005

.2730 ± .0005

.1726 ± .0005

.0260 ± .0005

MAX. CLEARANCE — .02

.02

RocaCM-19948

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

NOTE 1: MAKE NO CONNECTION.

NOTE 2: IF A CLAMP IS USED, IT MUST BE ADJUSTABLE IN A PLANE NORMAL TO THE MAJOR TUBE AXIS TO COMPENSATE FOR VARIATIONS IN CONCENTRICITY BETWEEN THE PLATE TERMINAL AND THE REMAINING CONTACT TERMINALS.

NOTE 3: MADE BY INSTRUMENTS SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.

NOTE 4: SEAT TUBE SUCH THAT GRID-No.2 TERMINAL EDGE MAKES A POSITIVE STOP ON SHOULDER.

NOTE 5: SPRING IS 0.600 INCH IN LENGTH AND 30 TURNS PER INCH OF 0.015-INCH-DIAMETER STEEL MUSIC WIRE.

NOTE 6: FINGER STOCK TO SEAT ON 0.013-INCH LIP.
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 12.6
GRID No. 2 VOLTS = 150

PLATE MILLIAMPERES

GRID NO. VOLTS ECL: 8

ECL = 16 14 12 10 8 6 4 2 0

PLATE VOLTS

0 200 400 600 800

92CM-10949

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 12.6
GRID-No.2 VOLTS = 225
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

HEATER VOLTS = 12.6
GRID-No. 2 VOLTS = 225
Ic₁ = GRID-No. 1 MA.
Ic₂ = GRID-No. 2 MA.
Super-Power Triode

10 MW SHORT-PULSE POWER, 5 MW LONG-PULSE POWER

CERAMIC-METAL SEALS
DOUBLE-ENDED CONSTRUCTION
COAXIAL-ELECTRODE STRUCTURE
INTEGRAL WATER DUCTS
17.00 INCHES MAX. LENGTH
24.00 INCHES MAX. DIAMETER

WATER COOLED

For Use as a Plate-Pulsed Amplifier at Frequencies up to 300 MHz, for Long Range Search Radar, Pulsed Transmission in Communications Service, and Particle Accelerator Service.

ELECTRICAL

Filamentary Cathode Multistrand Thoriated Tungsten

Current (DC):
Typical operating value .................................. 6600 a A
Maximum value .............................................. 7000 a A
Maximum value for starting even momentarily ......... 2000 a A
Minimum time to reach operating current ............... 30 s
Minimum time at normal operating current before plate voltage is supplied .......... 60 s

Voltage (DC):
Typical range value for prescribed operating current .................................. 3.1 to 4.2 V
Maximum value under any condition .................................. 4.65 V

Direct Inter-electrode Capacitances
Grid to plate ................................................. 150 pF
Grid to cathode ............................................. 1600 pF
Plate to cathode ........................................... less than 1.0 pF

MECHANICAL

Operating Position .............................................. Tube axis vertical, either end up
Overall Length .............................................. 17.00 max in
Maximum Diameter ........................................... 24.00 max in
Terminal Connections ......................................... See Dimensional Outline

Weight
Uncrated ........................................................... 190 lb
Crated ............................................................. 355 lb

THERMAL

Ceramic-Bushing Temperature .................................. 150 max °C
Metal-Surface Temperature .................................. 150 max °C
Minimum Storage Temperature ................................ -65 min °C

Water Flow

Typ. Flow | Min. Flow | Pressure Differential
----------|----------|---------------------
g/m | g/m | psi
40 | 35 | 5
100 | 90 | 30

For plate dissipation up to 50 kW (Average) ....
For plate dissipation of 150 kW (Average) ....
### Water Flow (cont'd)

<table>
<thead>
<tr>
<th></th>
<th>Typ. Flow g/s</th>
<th>Min. Flow g/s</th>
<th>Absolute Pressure for Typ. Flow C psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>For plate dissipation of 300 kW (Average)</td>
<td>160</td>
<td>150</td>
<td>45</td>
</tr>
<tr>
<td>To upper grid coolant course</td>
<td>3</td>
<td>2</td>
<td>25 max</td>
</tr>
<tr>
<td>To lower grid coolant course</td>
<td>3</td>
<td>2</td>
<td>25 max</td>
</tr>
<tr>
<td>To grid-cathode coolant course</td>
<td>35</td>
<td>30</td>
<td>30 max</td>
</tr>
</tbody>
</table>

Resistivity of water at 25°C:
- Plate and grid water: 1 min MC-cm
- Grid-cathode water: 5 min MC-cm

Water temperature from any outlet: 70 max °C

External gas pressure:
- Max Pressure: 65 max psig
- Max Pressure: 90 max psig

**TERMINAL DIAGRAM (Bottom View)**

- GUORF - Upper RF Grid Output Terminal
- GLIRF - Lower RF Grid Input Terminal
- GLORF - Lower RF Grid Output Terminal
- PLRF - Lower RF Plate Terminal
- PURF - Upper RF Plate Terminal
- FI - Filament Terminal (Inner)
- FO - Filament Terminal (Outer)
- KURF - Upper RF Cathode Terminal
- KLRF - Lower RF Cathode Terminal
- GURF - Upper RF Grid Input Terminal

### PLATE-PULSED AMPLIFIER—Class B9

For frequencies up to 300 MHz, and a maximum "ON" time of 2200 microseconds in any 34000-microsecond interval

**Absolute-Maximum Ratings**

- Peak Positive-Pulse Plate Voltage: 40 kV
- Peak Negative Grid Voltage: 250 V
- Peak Plate Current: 300 A
- Peak Cathode Current: 600 A
- DC Plate Current: 19.5 A
- DC Cathode Current: 39 A
- Plate Input (Average): 487 kW
- Plate Dissipation (Average): 300 kW

**Typical Operation**

In a cathode drive circuit, with rectangular-wave shape pulses, with duty factor of 0.06 pulse duration of 2000 microseconds, and at a frequency of 250 MHz

- Peak Positive-Pulse Plate-to-Grid Voltage: 34 kV
- Peak Cathode-to-Grid Voltage: 100 V
- Peak Plate Current: 265 A
### Absolute-Maximum Ratings

For frequencies up to 300 MHz and a maximum "ON" time of 25 microseconds in any 2500-microsecond interval.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>65 kV</td>
</tr>
<tr>
<td>Peak Negative Grid Voltage</td>
<td>500 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>325 A</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>500 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.25 A</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>5.5 A</td>
</tr>
<tr>
<td>Plate Input (Average)</td>
<td>212 kW</td>
</tr>
<tr>
<td>Plate Dissipation (Average)</td>
<td>150 kW</td>
</tr>
</tbody>
</table>

### Typical Operation

In a cathode-drive circuit, with rectangular-waveshape pulses, at 250 MHz with duty factor of 0.006, and pulse of 25 microseconds.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate-to-Grid Voltage</td>
<td>60 34 kV</td>
</tr>
<tr>
<td>Peak Cathode-to-Grid Voltage</td>
<td>300 100 V</td>
</tr>
<tr>
<td>Peak Plate Current</td>
<td>280 260 A</td>
</tr>
<tr>
<td>Peak Cathode Current</td>
<td>430 400 A</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.8 2.6 A</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>5 4.5 A</td>
</tr>
<tr>
<td>Peak Driver Power Output</td>
<td>200 150 kW</td>
</tr>
<tr>
<td>Useful Power Output at Peak of Pulse (Approx.)</td>
<td>10 5 kW</td>
</tr>
</tbody>
</table>

### Characteristics Range Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Strap-Resonant Frequency</td>
<td>90</td>
<td>140 MHz</td>
</tr>
<tr>
<td>Output Strap-Resonant Frequency</td>
<td>240</td>
<td>280 MHz</td>
</tr>
</tbody>
</table>

---

a. The specified maximum filament current is a maximum rating which should not be exceeded, even momentarily, during operation of the tube. The life of the tube can be conserved by operating the filament at the lowest current which will enable the tube to provide the desired power output. Because the filament when operated near the maximum value usually provides emission in excess of any requirements within the tube ratings, the filament current should be reduced to a value that will give adequate but not excessive emission for any particular application. Good regulation of the filament current is, in general, economically advantageous from the viewpoint of the tube life.

b. Measured between KLRF and KURF (See Personal Diagram).

c. Measured directly across cooled element for the indicated typical flow.

d. With the gauge located in an area where the maximum pressure external to the gauge is one atmosphere absolute.

e. "ON" time is defined as the sum of the duration of all individual pulses which occur during the indicated interval. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 50% of the peak power value. The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.

f. The magnitude of any spike on the plate voltage pulse should not exceed its peak value by more than 10%, and the duration of any spike when measured at the peak-value level should not exceed 5% of the pulse duration as defined in note(e). The peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the top portion of the pulse.
Peak or average cathode current is the total of the peak or average plate current and the peak or average rectified grid current. (Pulses are not coincident, hence they cannot be added arithmetically).

Duty factor is the product of the pulse duration and repetition rate.

Preferably obtained from a cathode bias resistor.

The driver stage is required to supply tube losses, rf circuit losses, and rf power added to the plate circuit. The driver stage should be designed to provide an excess of power above the indicated value to take care of variations in line voltage, in components, in initial tube characteristics, and in tube characteristics during life.

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

- See Electrical Considerations - Filament or Heater.
- See Cooling Considerations - Forced-Air Cooling.
- See Cooling Considerations - Liquid Cooling.
- See Classes of Service.

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

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey
A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.
Beam Power Tube

CERMOLOX Ruggedized Matrix-Type Cathode 80 Watts CW Power Output at 400 MHz
Conduction Cooled Linear RF Power Amplifier 40 Watts CW Power Output at 1215 MHz

ELECTRICAL

Heater for Matrix-Type, Oxide-Coated, Unipotential Cathode:
Voltage (ac or dc) .................................. 6.3 ± 10% V
Current at 26.5 volts ................................ 3.2 A
Minimum heating time .............................. 60 s
Mu-Factor, Grid No.2 to Grid No.1 ............. 18

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage .................................. 1000 V
DC Grid-No.2 Voltage .............................. 300 V
DC Grid-No.1 Voltage .............................. −100 V
DC Plate Current .................................. 180 mA
Plate Dissipation .................................. 115 W

MECHANICAL

Operating Position ................................ Any
Weight (Approx.) ................................... 2 oz (0.06 kg)

THERMAL

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

See Dimensional Outline for temperature-measurement points. Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
DIMENSIONAL OUTLINE

CONDUCTION CYLINDER

PLATE

PLATE TERMINAL

GRID-No.2 TERMINAL

HEATER-CATHODE TERMINAL

SEE FOOTNOTE(b) AXIAL PIN

TEMPERATURE MEASUREMENT POINT

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.900 ± .005</td>
<td>22.86 ± .1</td>
</tr>
<tr>
<td>B</td>
<td>1.085 Min.</td>
<td>27.56 Min.</td>
</tr>
<tr>
<td>C</td>
<td>0.985 Min.</td>
<td>25.02 Min.</td>
</tr>
<tr>
<td>D</td>
<td>0.735 Min.</td>
<td>18.67 Min.</td>
</tr>
<tr>
<td>E</td>
<td>0.480 Min.</td>
<td>12.32 Min.</td>
</tr>
<tr>
<td>F</td>
<td>0.280 Max.</td>
<td>6.60 Max.</td>
</tr>
<tr>
<td>G</td>
<td>0.062 Max.</td>
<td>1.57 Max.</td>
</tr>
<tr>
<td>H</td>
<td>1.88 ± .05</td>
<td>47.75 ± 1.27</td>
</tr>
<tr>
<td>J</td>
<td>1.51 ± .03</td>
<td>38.35 ± .76</td>
</tr>
<tr>
<td>K</td>
<td>0.730 ± .02</td>
<td>18.54 ± .51</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
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</tr>
<tr>
<td>E</td>
<td>0.480 Min.</td>
<td>12.32 Min.</td>
</tr>
<tr>
<td>F</td>
<td>0.280 Max.</td>
<td>6.60 Max.</td>
</tr>
<tr>
<td>G</td>
<td>0.062 Max.</td>
<td>1.57 Max.</td>
</tr>
<tr>
<td>H</td>
<td>1.88 ± .05</td>
<td>47.75 ± 1.27</td>
</tr>
<tr>
<td>J</td>
<td>1.51 ± .03</td>
<td>38.35 ± .76</td>
</tr>
<tr>
<td>K</td>
<td>0.730 ± .02</td>
<td>18.54 ± .51</td>
</tr>
</tbody>
</table>

92LM-2067VI

RCA Electronic Components

DATA
Beam Power Tube

CERMOLOX

Oxide-Coated Cathode
Conduction Cooled
Linear RF Power Amplifier

80 Watts CW Power Output
of 400 MHz

40 Watts CW Power Output
of 1215 MHz

ELECTRICAL
Heater for Oxide-Coated Unipotential Cathode:
Voltage (ac or dc) .................. 26.5 ± 10%  
Current at 26.5 volts. .......... 0.5 A
Minimum heating time ................. 60 s
Mu-Factor, Grid No.2 to Grid No.1 .... 18

MAXIMUM CCS RATINGS, Absolute-Maximum Values

Up to 1215 MHz:

DC Plate Voltage .................. 1000 V
DC Grid-No.2 Voltage .............. 300 V
DC Grid-No.1 Voltage .............. -100 V
DC Plate Current .................. 180 mA
Plate Dissipation ................. 115 W

MECHANICAL
Operating Position ................ Any
Weight (Approx.) .................. 2 oz (0.06 kg)

THERMAL

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

See Dimensional Outline for temperature measurement points.

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

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
DIMENSIONAL OUTLINE

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.900 ± .005</td>
<td>22.86 ± .1</td>
</tr>
<tr>
<td>B</td>
<td>1.085 Min.</td>
<td>27.56 Min.</td>
</tr>
<tr>
<td>C</td>
<td>0.985 Min.</td>
<td>25.02 Min.</td>
</tr>
<tr>
<td>D</td>
<td>0.735 Min.</td>
<td>18.67 Min.</td>
</tr>
<tr>
<td>E</td>
<td>0.480 Min.</td>
<td>12.32 Min.</td>
</tr>
<tr>
<td>F</td>
<td>0.260 Max.</td>
<td>6.60 Max.</td>
</tr>
<tr>
<td>G</td>
<td>0.062 Max.</td>
<td>1.57 Max.</td>
</tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>0.68 ± .02</td>
<td>16.76 ± .51</td>
</tr>
<tr>
<td>N</td>
<td>0.175 ± .015</td>
<td>4.45 ± .38</td>
</tr>
<tr>
<td>P</td>
<td>0.37 ± .02</td>
<td>9.40 ± .51</td>
</tr>
<tr>
<td>R</td>
<td>0.025 ± .025</td>
<td>0.64 ± .64</td>
</tr>
<tr>
<td>S</td>
<td>0.06 Min.</td>
<td>1.52 Min.</td>
</tr>
<tr>
<td>T</td>
<td>0.09 Min.</td>
<td>2.29 Min.</td>
</tr>
<tr>
<td>U</td>
<td>0.12 Min.</td>
<td>3.05 Min.</td>
</tr>
<tr>
<td>V</td>
<td>0.095 Min.</td>
<td>2.41 Min.</td>
</tr>
<tr>
<td>W</td>
<td>0.10 Min.</td>
<td>2.54 Min.</td>
</tr>
<tr>
<td>X</td>
<td>0.054 Min.</td>
<td>1.37 Min.</td>
</tr>
</tbody>
</table>

SEE FOOTNOTE (b) AXIAL PIN

TEMPERATURE MEASUREMENT POINT

92LM-2067VI
Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN
CONDUCTION COOLEE
COAXIAL-ELECTRODE STRUCTURE

52.5-WATTS CW INPUT
27-WATTS CW OUTPUT AT 400 Mc
15-WATTS CW OUTPUT AT 1200 Mc
3.2-WATTS CW OUTPUT AT 3000 Mc

UNIPOTENTIAL CATHODE

The 7870 is the same as the 7801 except for the following items:

Heater, for Unipotential Cathode:
Voltage (AC or DC)* .... 6.3 ± 10% volts
Current at heater volts = 6.3 .... 1 amp

* Because the cathode is subjected to considerable back bombardment as
the frequency is increased with resultant increase in temperature, the
heater voltage should be reduced depending on operating conditions
and frequency to prevent overheating the cathode and resultant short life.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td>1.088</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Direct Interelectrode Capacitances:

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to plate</td>
<td>2.025</td>
<td>μf</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
<td>8.5</td>
<td>10.3 μf</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td>0.004</td>
<td>μf</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2.</td>
<td>14</td>
<td>20.6 μf</td>
</tr>
<tr>
<td>Grid No.2 to plate.</td>
<td>2.1</td>
<td>2.5 μf</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
<td>0.18</td>
<td>μf</td>
</tr>
<tr>
<td>Grid-No.1 Voltage</td>
<td>1.3</td>
<td>-10 volts</td>
</tr>
<tr>
<td>Grid-No.1 Cutoff Voltage.</td>
<td>1.4</td>
<td>-25 volts</td>
</tr>
<tr>
<td>Grid-No.2 Current.</td>
<td>1.3</td>
<td>2 ma</td>
</tr>
<tr>
<td>Positive Grid-No.1 Voltage.</td>
<td>0</td>
<td>14 volts</td>
</tr>
<tr>
<td>Transconductance.</td>
<td>1.6</td>
<td>7500 μhos</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac or dc on heater.
Note 2: Measured with special shield adapter.
Note 3: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts,
and dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.
Note 4: With dc plate voltage of 750 volts, dc grid-No.2 voltage of 250 volts,
and dc grid-No.1 voltage adjusted to give a dc plate current of 1 ma.
Note 5: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 250 volts,
and dc grid-No.1 voltage of -100 volts. Rectangular pulses, pulse duration of 500 to 5000 microseconds
and pulse-repetition frequency of 10 to 12 pps. The positive-pulse grid-
No.1 voltage is adjusted to give a plate current of 300 ma at
leading edge of pulse.
Note 6: With dc plate voltage of 300 volts, dc grid-No.2 voltage of 150 volts,
dc grid-No.1 voltage adjusted to give a dc plate current of 35 ma.

Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 9-62
OSCI LLATOR. POWER AMPLIFIER, MODULAT OR

Filament: Thoriated Tungsten
Voltage: 10 a-c or d-c volts
Current: 3.25 amp.
Amplification Factor: 12
Direct Interelectrode Capacitances (Approx.):
- Grid to Plate: 11 μf
- Grid to Filament: 5.8 μf
- Plate to Filament: 3.4 μf
Maximum Overall Length: 8-1/2"
Maximum Diameter: 2-9/16"
Bulb: T-20
Cap: Medium Metal
Base: Jumbo 4-Large Pin

MAXIMUM CCS RATINGS with TYPICAL OPERATING CONDITIONS

CCS = Continuous Commercial Service

A-F POWER AMPLIFIER & MODULATOR — Class B

D-C Plate Voltage: 1350 max. volts
Max.-Signal D-C Plate Current*: 250 max. ma.
Max.-Signal Plate Input*: 330 max. watts
Plate Dissipation*: 100 max. watts

Typical Operation:
- Unless otherwise specified, values are for 2 tubes
- D-C Plate Voltage: 1350 volts
- D-C Grid Voltage#: -100 volts
- Peak A-F Grid-to-Grid Voltage: 480 volts
- Zero-Sig. D-C Plate Current: 40 ma.
- Max.-Sig. D-C Plate Current: 490 ma.
- Load Resistance (per tube): 1500 ohms
- Effective Load Resistance (plate to plate): 6000 ohms
- Max.-Sig. Driving Power: 10.5 approx. watts
- Max.-Sig. Power Output: 460 approx. watts

* Averaged over any audio-frequency cycle of sine-wave form.

R-F POWER AMPLIFIER—Class B Telephony

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

D-C Plate Voltage: 1350 max. volts
D-C Plate Current: 150 max. ma.
Plate Input: 150 max. watts
Plate Dissipation: 100 max. watts

Typical Operation:
- D-C Plate Voltage: 1350 volts
- D-C Grid Voltage#: -110 volts
- Peak R-F Grid Voltage: 135 volts
- D-C Plate Current: 110 ma.
- D-C Grid Current**: 1.5 approx. ma.
- Driving Power**: 6 approx. watts
- Power Output: 50 approx. watts

** At crest of audio-frequency cycle with modulation factor of 1.0.
#: See end of tabulation.

TENTATIVE DATA
RCA RADIONRON DIVISION
RCA MANUFACTURING COMPANY, INC.

July 1, 1941
OSCILLATOR, POWER AMPLIFIER, MODULATOR

(continued from preceding page)

PLATE-MODULATED R-F POWER AMPLIFIER—Class C Telephony

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td>1100 max. volts</td>
</tr>
<tr>
<td>D-C Grid Voltage</td>
<td>-400 max. volts</td>
</tr>
<tr>
<td>D-C Plate Current</td>
<td>200 max. ma.</td>
</tr>
<tr>
<td>D-C Grid Current</td>
<td>50 max. ma.</td>
</tr>
<tr>
<td>Plate input</td>
<td>220 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>67 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td>1100 volts</td>
</tr>
<tr>
<td>D-C Grid Voltage</td>
<td>-260 ohms</td>
</tr>
</tbody>
</table>

Peak R-F Grid Voltage 430 volts

D-C Plate Current 200 ma.

D-C Grid Current 40 approx. ma.

Driving Power 15 approx. watts

Power Output 167 approx. watts

\[\text{\textsuperscript{△}}\text{ Obtained from grid resistor of value shown or by combination methods.}\]

R-F POWER AMPLIFIER & OSCILLATOR—Class C Telegraphy

\[\text{\textsuperscript{Key-down conditions per tube without modulation}}\]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td>1350 max. volts</td>
</tr>
<tr>
<td>D-C Grid Voltage</td>
<td>-400 max. volts</td>
</tr>
<tr>
<td>D-C Plate Current</td>
<td>250 max. ma.</td>
</tr>
<tr>
<td>D-C Grid Current</td>
<td>50 max. ma.</td>
</tr>
<tr>
<td>Plate Input</td>
<td>330 max. watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>100 max. watts</td>
</tr>
</tbody>
</table>

Typical Operation:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td>1350 volts</td>
</tr>
<tr>
<td>D-C Grid Voltage</td>
<td>-175 volts</td>
</tr>
</tbody>
</table>

Peak R-F Grid Voltage 350 volts

D-C Plate Current 245 ma.

D-C Grid Current 35 approx. ma.

Driving Power 11 approx. watts

Power Output 250 approx. watts

\[\text{\textsuperscript{△}}\text{ Obtained from fixed supply, by grid resistor (5000), or by cathode}}

\text{\textsuperscript{resistor (600).}}

\textbf{NOTE:} When the 8003 is used in the final amplifier or a preceding stage of a transmitter designed for break-in operation and oscillator keying, a small amount of fixed bias must be used to maintain the plate current at a safe value. With plate voltage of 1350 volts, a fixed bias at least -85 volts should be used.

\[\text{\textsuperscript{\textcircled{\textbullet}}}\text{ Indicates a change.}\]
OSCILLATOR, POWER AMPLIFIER, MODULATOR

(continued from preceding page)

<table>
<thead>
<tr>
<th>OSCILLATOR - OPERATION WITH UNFILTERED PLATE SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply 1</strong></td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Plate Voltage</td>
</tr>
<tr>
<td>D-C Grid Voltage</td>
</tr>
<tr>
<td>D-C Plate Current</td>
</tr>
<tr>
<td>D-C Grid Current</td>
</tr>
<tr>
<td>Plate Input</td>
</tr>
<tr>
<td>Plate Dissipation</td>
</tr>
</tbody>
</table>

Typical Operation in push-pull circuit at 25 Mc:

Unless otherwise specified, values are for 2 tubes:

| Plate Voltage | 1500 (RMS) | 1200 | volts |
| Grid Resistor | 2000 | 3000 | ohms |
| D-C Plate Current | 400 | 450 | ma. |
| D-C Grid Current | 35 | 45 | ma. |
| Power Output | 500 | 450 approx. watts |

Circuit Power Output (85% circuit efficiency): 425 approx. watts |

1 Self-rectified a-c supply. (Plate voltages are RMS values.)
2 Separate rectified (no filter) single-phase, full-wave plate supply.

For applications where grid current and grid voltage may vary widely because of fluctuating loads, it is important to design equipment so that the maximum grid-current and grid-voltage ratings are never exceeded for any load. An approximate rule is to adjust the grid-current and grid-voltage values at full-load to one-half of the corresponding maximum values. This operating condition permits grid-current and grid voltage values to rise for zero-load to twice their full-load values, and usually provides adequate leeway.

Data on operating frequencies for the 8003 are given on the sheet TRANS. TUBE RATINGS vs FREQUENCY.

CURVES for the 8003 are the same as those for Type 211.

---

July 1, 1941

TENTATIVE DATA 2
OSCILLATOR, POWER AMPLIFIER, MODULATOR

TENTATIVE DATA 2

July 1, 1941

TUBE MOUNTING POSITION

VERTICAL: Base down.
HORIZONTAL: With plane of electrodes vertical (on edge).

F - Filament
G - Grid
P - Plate
NC - No Connection
BP - Bayonet Pin
The 8008 is the same as the 872-A except for the following items:

**Mechanical:**
- Maximum Overall Length: 8-3/4" ± 1/4"
- Seated Length: 7-3/4" ± 1/4" ± 1/4"
- Weight (Approx.): 6.8 oz ± 1/4"
- Base: Large-Metal-Shell Super-Jumbo 4-Pin with Bayonet (JETEC No. A4-18)

**Basing Designation for BOTTOM VIEW:**
- Pin 1 - No Connection
- Pin 2 - Filament, Cathode, Shield
- Pin 3 - Filament, Cap
- Pin 4 - No Connection, Anode

**Zone where condensed-mercury temperature should be measured:**
- 5° / 1° max.

**Dimensions:**
- MEDIUM CAP
  - JETEC No. CI-5
- LARGE-METAL-SHELL SUPER-JUMBO 4-PIN BAYONET BASE JETEC No. A4-18
- TUBE BULB
- 8 3/4" max.
- 7 3/4" ± 1/4"
- 2 5/16" MAX.

---

Indicates a change.
HALF-WAVE VACUUM RECTIFIER

GENERAL DATA

Electrical:
Filament, Thoriated Tungsten:

<table>
<thead>
<tr>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
<th>2.37</th>
<th>2.50</th>
<th>2.63</th>
</tr>
</thead>
<tbody>
<tr>
<td>volts</td>
<td>volts</td>
<td>volts</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Current at 2.50 volts: 4.7 5.0 5.3 amp

Mechanical:
Mounting Position: Any, preferably vertical with base down
Maximum Overall Length: 6-1/16" ± 5/32"
Maximum Diameter: 2-1/16"
Weight (Approx.): 2.9 oz
Bulb: ST-16
Cap: Skirted Medium with Rolled Edge (JETEC No. C1-19)
Base: Medium-Shell Small 4-Pin (JETEC No. A4-9)

Basing Designation for BOTTOM VIEW: 4P

Pin 1 - Filament 
Pin 2 - No Connection 
Pin 3 - No Connection 
Pin 4 - Filament Cap - Plate

HALF-WAVE RECTIFIER

Maximum Ratings, Absolute Values:

PEAK PLATE VOLTAGE:
Forward 40000 max. volts
Inverse 40000 max. volts

PLATE CURRENT:
Peak 150 max. ma
Average 20 max. ma
Fault 500 max. ma

PLATE DISSIPATION: 12 max. watts

OPERATING CONSIDERATIONS

Filament and plate voltage may be applied simultaneously to the 8013-A.

The bulb of the 8013-A should be cleaned regularly. Accumulation of dust or other foreign matter on the bulb will cause leakage and, as a result, probably tube failure.

X-rays are produced during normal operation of the 8013-A. These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure it provides the required protection to the operator.

This value may be increased to 55000 volts when the 8013-A is immersed in oil.

SEPT. 1, 1955
HALF-WAVE VACUUM RECTIFIER

AVG. PLATE CHARACTERISTIC

PLATE MILLIAMPERES

0 200 400 600 800 1000 1200
DC PLATE VOLTS

0 100 200 300 400

$E_f = 2.5$ VOLTS AC

92CM-6344T

SKIRTED MEDIUM CAP WITH ROLLED EDGE
JETEC NO. CI-19

ST 16 BULB

MEDIUM-SHELL
SMALL 4-PIN BASE
JETEC NO. A4-9

92CM-6423R3

SEPT. 1, 1955

TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

CE-6344T-6423R3
HALF-WAVE HIGH-VACUUM RECTIFIER

**DATA**

**Electrical:**

Filament, Thoriated Tungsten:
- Voltage: 5 volts
- Current: 5.5 - 6.5 amp

Direct Interelectrode Capacitance:
- Anode to Filament: 1.4 μf

Tube Voltage Drop:
- at 100 ma: 200 volts

**Mechanical:**

- Mounting Position: Vertical, Base Down
- Overall Length: 7-1/2" ± 1/2"
- Maximum Diameter: 2-5/16"
- Bulb: Medium 7-18
- Cap: Medium 4-Pin, Bayonet

**RECTIFIER SERVICE**

Maximum Ratings, Absolute Values:
- PEAK INVERSE ANODE VOLTAGE: 40000 max. volts
- PEAK ANODE CURRENT: 750 max. ma
- AVERAGE ANODE CURRENT: 100 max. ma

**SURGE-LIMITING DIODE SERVICE**

Maximum Ratings, Absolute Values:
- FILAMENT VOLTAGE: 5.8 max. volts
- PEAK FORWARD ANODE VOLTAGE: 12500 max. volts
- AVERAGE ANODE DISSIPATION: 75 max. watts

**Typical Operation:**

- Filament Voltage: 5.5 volts
- Peak Forward Anode Voltage: 10000 volts
- Minimum Peak Anode Current: 2 amp

MAY 1, 1946
TUBE DIVISION
TENTATIVE DATA
HALF-WAVE HIGH-VACUUM RECTIFIER

ANODE TERMINAL

MEDIUM CAP

2 5/16 MAX. DIA.

MEDIUM
4-PIN
BASE WITH
BAYONET

NO CONNECTION

FILAMENT TERMINALS

92C5-6721

PLATE CHARACTERISTICS

PLATE CURRENT IN MILLIAMPERES

PLATE VOLTAGE IN VOLTS

MAY 1, 1946

TUBE DIVISION

RAO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

E_p = 5 VOLTS
Beam Power Tube

CERAMIC-METAL SEALS
CONDUCTION COOLED

COAXIAL-ELECTRODE STRUCTURE
UNIPOTENTIAL CATHODE

For Use in Low-Voltage Mobile Equipment at Frequencies up to 500 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:
Voltage range (AC or DC) a ....... 12.0 to 15.0 volts
Current (Approx.) at 13.5 volts ....... 1.3 amp
Minimum heating time ....... 60 sec
Mu-Factor, Grid No. 2 to Grid No. 1
for plate volts = 250, grid-No. 2
volts = 200, plate amperes = 1.2 ....... 11

Direct Interelectrode Capacitances:
Grid No. 1 to plate ........ 0.13 max. \( \mu f \)
Grid No. 1 to cathode ........ 16 \( \mu f \)
Plate to cathode ........ 0.011 \( \mu f \)
Grid No. 1 to grid No. 2 ....... 22 \( \mu f \)
Grid No. 2 to plate ....... 6.5 \( \mu f \)
Grid No. 2 to cathode ....... 3.2 \( \mu f \)
Cathode to heater ....... 3.4 \( \mu f \)

Mechanical:

Operating Position ........ Any
Maximum Overall Length ........ 2.26"
Seated Length ........ 1.920" \( \pm 0.065" \)
Diameter ........ 1.426" \( \pm 0.010" \)
Weight (Approx.) ........ 2 oz
Socket ........ Mycalex\textsuperscript{c} No. CP464-2, or equivalent
Base ........ Large-Wafer Elevenar 11-Pin with Ring
(JEDEC, No. E11-81)

Terminal Connections (See Dimensional Outline):

<table>
<thead>
<tr>
<th>Pin 1 - Cathode</th>
<th>Pin 2 - Grid No. 2</th>
<th>Pin 3 - Grid No. 1</th>
<th>Pin 4 - Cathode</th>
<th>Pin 5 - Heater</th>
<th>Pin 6 - Heater</th>
<th>Pin 7 - Grid No. 2</th>
<th>Pin 8 - Grid No. 1</th>
<th>Pin 9 - Cathode</th>
<th>Pin 10 - Grid No. 2</th>
<th>Pin 11 - Grid No. 1</th>
</tr>
</thead>
</table>

Thermal:

Terminal Temperature (All terminals) ........ 250 max. \( ^\circ C \)
Plate Core Temperature (See Dimensional Outline) ........ 250 max. \( ^\circ C \)

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

DATA 1
3-62
Cooling, Conduction:
The plate-terminal (cylinder) must be thermally coupled to a constant temperature device (heat-sink—solid or liquid) to limit the plate terminal to the specified maximum value of 250°C. The grid No.2, grid No.1, cathode, and heater terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250°C.

**LINEAR RF POWER AMPLIFIER**

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:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE.</td>
<td>2200 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE.</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE.</td>
<td>-100 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT AT PEAK OF ENVELOPE.</td>
<td>450° max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT.</td>
<td>100 max. ma</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>100° max. watts</td>
</tr>
<tr>
<td>GRID-No.2 DISSIPATION</td>
<td>8 max. watts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode.</td>
<td>150 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode.</td>
<td>150 max. volts</td>
</tr>
</tbody>
</table>

**Typical CCS Operation with "Two-Tone Modulation":**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage.</td>
<td>700 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-20 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current.</td>
<td>100 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance.</td>
<td>1420 ohms</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope.</td>
<td>205 ma</td>
</tr>
<tr>
<td>Average</td>
<td>150 ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current:</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope.</td>
<td>16 ma</td>
</tr>
<tr>
<td>Average</td>
<td>10 ma</td>
</tr>
<tr>
<td>Average DC Grid-No.1 Current.</td>
<td>1° ma</td>
</tr>
<tr>
<td>Peak-of-Envelope Driver Power Output (Approx.)</td>
<td>0.3 watt</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>95 %</td>
</tr>
<tr>
<td>Distortion Products Level:</td>
<td></td>
</tr>
<tr>
<td>Third order</td>
<td>30 db</td>
</tr>
<tr>
<td>Fifth order</td>
<td>35 db</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope.</td>
<td>80° watts</td>
</tr>
<tr>
<td>Average</td>
<td>40° watts</td>
</tr>
</tbody>
</table>

Radio Corporation of America
Electron Tube Division
Harrison, N. J.
Maximum Circuit Values:

<table>
<thead>
<tr>
<th></th>
<th>Grid-No.1-Circuit Resistance</th>
<th>Grid-No.2-Circuit Impedance</th>
<th>Plate-Circuit Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>under any condition:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With fixed bias</td>
<td>25000 max. ohms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With fixed bias (in Class-AB operation)</td>
<td>100000 max. ohms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy**

**RF POWER AMPLIFIER — Class C FM Telephony**

Maximum CCS Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th></th>
<th>Up to 500 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DC PLATE VOLTAGE</strong></td>
<td>2200 max. volts</td>
</tr>
<tr>
<td><strong>DC GRID-No.2 VOLTAGE</strong></td>
<td>400 max. volts</td>
</tr>
<tr>
<td><strong>DC GRID-No.1 VOLTAGE</strong></td>
<td>-100 max. volts</td>
</tr>
<tr>
<td><strong>DC PLATE CURRENT.</strong></td>
<td>300 max. ma</td>
</tr>
<tr>
<td><strong>DC GRID-No.1 CURRENT.</strong></td>
<td>100 max. ma</td>
</tr>
<tr>
<td><strong>GRID-No.2 DISSIPATION</strong></td>
<td>8 max. watts</td>
</tr>
<tr>
<td><strong>PLATE DISSIPATION</strong></td>
<td>100 max. watts</td>
</tr>
<tr>
<td><strong>PEAK HEATER-CATHODE VOLTAGE:</strong></td>
<td>Heights negative with respect to cathode. 150 max. volts</td>
</tr>
<tr>
<td></td>
<td>Heights positive with respect to cathode. 150 max. volts</td>
</tr>
</tbody>
</table>

Typical CCS Operation:

In grid-drive circuit at frequency of 50°, 75°, 47° Mc

<table>
<thead>
<tr>
<th></th>
<th>50°</th>
<th>75°</th>
<th>47°</th>
<th>Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500</td>
<td>700</td>
<td>700</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>160</td>
<td>200</td>
<td>200</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10</td>
<td>-30</td>
<td>-30</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>25</td>
<td>20</td>
<td>20</td>
<td>ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>50</td>
<td>40</td>
<td>40</td>
<td>ma</td>
</tr>
</tbody>
</table>

Driver Power Output (Approx.)P: 1.2 1.2 3 3 5 watts

Useful Power Output:

Typical: 85°, 110°, 70°, 105°, 85° watts

For minimum useful-power output see Characteristics Range Values, Test. No.8, No.9, No.10

Maximum Circuit Values:

<table>
<thead>
<tr>
<th></th>
<th>Grid-No.1-Circuit Resistance</th>
<th>Grid-No.2-Circuit Impedance</th>
<th>Plate-Circuit Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>under any condition:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With fixed bias</td>
<td>25000 max. ohms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Because the cathode is subjected to back bombardment as the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 Mc, heater volts = 12.5 (Approx.).

Measured with special shield adapter.

Mycalex Corporation of America, 125 Clifton Boulevard, Clifton, New Jersey.

For use at higher frequencies.

The maximum rating for a signal having a minimum peak-to-average power ratio less than 2, such as obtained in "Single-Tone" operation, is 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.

Maximum plate dissipation is limited by the maximum plate core temperature and the cooling system to maintain tube operation below the specified maximum plate core temperature. With simple low-cost cooling techniques, maximum plate dissipation may be only about 100 watts; with more sophisticated cooling techniques, maximum plate dissipation may be as high as 300 watts.

Obtained preferably from a separate, well-regulated source.

This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

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.

With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

The value of useful power is measured at load of output circuit.

The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

---

**CHARACTERISTICS RANGE VALUES**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td>1</td>
<td>1.15</td>
<td>1.45</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>-</td>
<td>-</td>
<td>0.13</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>-</td>
<td>14.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>-</td>
<td>0.0065</td>
<td>0.0155</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>-</td>
<td>19.8</td>
<td>24.2</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>-</td>
<td>5.7</td>
<td>7.1</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>-</td>
<td>2.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Cathode to heater</td>
<td>-</td>
<td>2.5</td>
<td>4.1</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1,3</td>
<td>-8</td>
<td>-19</td>
</tr>
<tr>
<td>4. Reverse Grid-No.1 Current</td>
<td>1,3</td>
<td>-</td>
<td>-25</td>
</tr>
<tr>
<td>5. Grid-No.2 Current</td>
<td>1,3</td>
<td>-7</td>
<td>+6</td>
</tr>
<tr>
<td>6. Peak Emission</td>
<td>1,4</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>7. Interelectrode Leakage Resistance</td>
<td>5</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>8. Useful Power Output</td>
<td>1,6</td>
<td>90</td>
<td>-</td>
</tr>
<tr>
<td>9. Useful Power Output</td>
<td>1,7</td>
<td>85</td>
<td>-</td>
</tr>
<tr>
<td>10. Useful Power Output</td>
<td>1,8</td>
<td>75</td>
<td>-</td>
</tr>
<tr>
<td>11. Cutoff Grid-No.1 Voltage</td>
<td>1,9</td>
<td>-</td>
<td>-44</td>
</tr>
</tbody>
</table>
Note 1: With 13.5 volts ac or dc on heater.
Note 2: Measured with special shield adapter.
Note 3: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 ma.
Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 pps. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.
Note 5: Under conditions 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 electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
Note 6: In a CW grid-driven, conduction-cooled amplifier circuit at 50 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -10 volts, driver power output of 1.2 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.
Note 7: In a CW grid-driven, conduction-cooled amplifier circuit at 175 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -30 volts, driver power output of 3 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.
Note 8: In a CW grid-driven, conduction-cooled amplifier circuit at 470 Mc and for conditions: dc plate voltage of 700 volts, grid-No.1 voltage of -30 volts, driver power output of 5 watts, and grid-No.2 voltage varied to obtain a plate current of 300 ma.
Note 9: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage varied to obtain a plate current of 5 ma.

**COOLING CONSIDERATIONS**

The conduction-cooling system consists, in general, of a constant temperature device (heat sink) and suitable heat-flow path (coupling device) between the heat sink and tube. Primary consideration of the system should be given to the design of a heat-flow path (coupling device) with high thermal conductivity.

Thermal conductivity \( q \) may be calculated from the equation:

\[
K = \frac{W}{A} \frac{(T_2 - T_1)}{L}
\]

(1)

where:

- \( K \) = thermal conductivity of the material
- \( W \) = power transfer in watts
- \( A \) = area measured at right angles to the direction of the flow of heat in square inches
- \( T_1, T_2 \) = temperature in degrees Centigrade of planes or surfaces under consideration
- \( L \) = length of heat path in inches through coupling material to produce temperature gradient

\( q \) Thermal conductivity is defined as the time rate of transfer of heat by conduction, through unit thickness, across unit area for unit difference of temperature. It is measured in watts per square inch for a thickness of one inch and a difference of temperature of 1° C.
For a given system Equation (1) must be integrated to consider changes in area (A) dependent on the coupling configuration and changes in thermal conductivity (K) dependent on various coupling materials and interfaces. Equation (1) may now be reduced to the following:

\[ K_S = \frac{W_p}{T_2 - T_1} \]  

(2)

where:

- \( K_S \) = thermal conductance of the system
- \( W_p \) = maximum permissible plate dissipation in watts
- \( T_2 \) = temperature in degrees Centigrade at tube terminal

Note: This value may never exceed the specified maximum rating for terminal temperature.

\( T_1 \) = temperature in degrees Centigrade of heat sink
NOTE 1: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

NOTE 2: THE DIAMETERS OF THE PLATE TERMINAL CONTACT SURFACE, GRID-No.2 TERMINAL CONTACT SURFACE, AND PIN CIRCLE TO BE CONCENTRIC WITHIN THE FOLLOWING VALUES OF MAXIMUM FULL INDICATOR READING:

- Plate Terminal Contact Surface to Grid-No.2 Terminal Contact Surface: 0.030"
- Plate Terminal Contact Surface to Pin Circle: 0.040"
- Grid-No.2 Terminal Contact Surface to Pin Circle: 0.030"

NOTE 3: THE FULL INDICATOR READING IS THE MAXIMUM DEVIATION IN RADIAL POSITION OF A SURFACE WHEN THE TUBE IS COMPLETELY ROTATED ABOUT THE CENTER OF THE REFERENCE SURFACE. IT IS A MEASURE OF THE TOTAL EFFECT OF RUN-OUT AND ELLIPTICITY.
TYPICAL CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No. 2 VOLTS = 400
GRID-No. 1 VOLTS = $E_{C1}$
$IC_1 = \_\_\_\_\_\_\_\_\_
IC_2 = \_\_\_\_\_\_\_\_

GRID-No. 1 (IC_1) OR GRID-No. 2 (IC_2) MILLIAMPERES

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No. 2 VOLTS = 250
GRID-No. 1 VOLTS = EC1
IC1 = 
IC2 = 

GRID-No.1 (IC1) or GRID-No.2 (IC2) MILLIAMPERES

+15

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Beam Power Tube

CERAMIC-METAL SEALS
FORCED-AIR COOLED
COAXIAL-ELECTRODE STRUCTURE
UNIPOTENTIAL CATHODE
170 WATTS PEP OUTPUT AT 30 MHz
235 WATTS CW OUTPUT AT 470 MHz
INTEGRAL RADIATOR

Full Ratings up to 500 MHz

ELECTRICAL

Heater, for Unipotential Cathode
Voltage (AC or DC)\(^a\) ....... 13.5 ± 10% V
Current at 13.5 volts. ........ 1.3 A
Minimum heating time ........ 60 s
Mu-Factor, Grid No.2 to Grid No.1. ....... 12
Plate volts = 450, grid No.2 volts = 325, plate A = 1.2
Direct Interelectrode Capacitances\(^b\)
Grid No.1 to plate ....... 0.13 max pF
Grid No.1 to cathode ....... 16 pF
Plate to cathode ...... 0.011 pF
Grid No.1 to grid No.2 ....... 24 pF
Grid No.2 to plate ....... 6.5 pF
Grid No.2 to cathode ....... 2.6 pF
Cathode to heater ....... 3.4 pF

MECHANICAL

Operating Position ....... Any
Maximum Overall Length ....... 2.196 in
Seated Length ........ 1.850 ± 0.065 in
Greatest Diameter .......... 1.460 ± 0.015 in
Weight (Approx.) ....... 3 oz
Socket ....... Mycalex\(^c\) No.CP464-2, or equivalent
Base ....... Large-Wafer Elevenar 11-Pin with Ring

(Typical Cooling Requirements curve.)

TERMINAL DIAGRAM (Bottom View)

Pin 1 - Cathode
Pin 2 - Grid No.2
Pin 3 - Grid No.1
Pin 4 - Cathode
Pin 5 - Heater
Pin 6 - Heater
Pin 7 - Grid No.2
Pin 8 - Grid No.1
Pin 9 - Cathode
Pin 10 - Grid No.2
Pin 11 - Grid No.1
RADIATOR - Plate
Radiator Core Temperature

Terminal Temperature (All Terminals) ....... 250 °C
Radiator Core Temperature

See Dimensional Outline ....... 250 °C

Air Flow

See accompanying Typical Cooling Requirements curve.

\(^a\) Change.

\(^b\) Indicates a change.

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA I
10-66
LINEAR RF POWER AMPLIFIER

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>450 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>150 W</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 W</td>
</tr>
</tbody>
</table>

Peak Heater-Cathode Voltage

Heater negative with respect to cathode... 150 V
Heater positive with respect to cathode... 150 V

Typical CCS Operation with "Two-Tone Modulation"

At 30 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-20 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>2270 Ω</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope</td>
<td>210 mA</td>
</tr>
<tr>
<td>Average</td>
<td>160 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope</td>
<td>10 mA</td>
</tr>
<tr>
<td>Average</td>
<td>7 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.1 Current</td>
<td>0.059 mA</td>
</tr>
<tr>
<td>Peak-of-Envelope Driver Power</td>
<td>0.3 W</td>
</tr>
<tr>
<td>Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 %</td>
</tr>
<tr>
<td>Distortion Products Level</td>
<td></td>
</tr>
<tr>
<td>Third order</td>
<td>35 dB</td>
</tr>
<tr>
<td>Fifth order</td>
<td>40 dB</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope</td>
<td>110k W</td>
</tr>
<tr>
<td>Average</td>
<td>55k W</td>
</tr>
</tbody>
</table>

Maximum Circuit Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance Under Any Condition</td>
<td></td>
</tr>
<tr>
<td>With fixed bias</td>
<td>25000 Ω</td>
</tr>
<tr>
<td>With fixed bias (in Class AB operation)</td>
<td>100000 Ω</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Grid-No.2-Circuit Impedance</td>
<td>10000 Ω</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td></td>
</tr>
</tbody>
</table>

DATA I  RADIO CORPORATION OF AMERICA
Electronic Components and Devices  Harrison, N. J.
### RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy

### RF POWER AMPLIFIER — Class C FM Telephony

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1800 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>5 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>105 W</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td>150 V</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td>150 V</td>
</tr>
</tbody>
</table>

### Typical CCS Operation

#### In Grid-Drive Circuit at Frequency of

<table>
<thead>
<tr>
<th>Frequency</th>
<th>DC Plate Voltage</th>
<th>DC Grid-No.2 Voltage</th>
<th>DC Grid-No.1 Voltage</th>
<th>DC Plate Current</th>
<th>DC Grid-No.2 Current</th>
<th>DC Grid-No.1 Current</th>
<th>Driver Power Output</th>
<th>Useful Power Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 500 MHz</td>
<td>700</td>
<td>175</td>
<td>-10</td>
<td>300</td>
<td>25</td>
<td>50</td>
<td>(Approx.)</td>
<td>120k</td>
</tr>
<tr>
<td>50 MHz</td>
<td>1000</td>
<td>200</td>
<td>-30</td>
<td>300</td>
<td>20</td>
<td>40</td>
<td>1.2</td>
<td>175k</td>
</tr>
<tr>
<td>470 MHz</td>
<td>1500</td>
<td>200</td>
<td>-30</td>
<td>300</td>
<td>10</td>
<td>40</td>
<td>2</td>
<td>275k</td>
</tr>
<tr>
<td>700</td>
<td>1000</td>
<td>200</td>
<td>300</td>
<td>100P</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>1500</td>
<td>200</td>
<td>300</td>
<td>165P</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>200</td>
<td>300</td>
<td>300</td>
<td>235P</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Maximum Circuit Values

<table>
<thead>
<tr>
<th>Condition</th>
<th>Resistance</th>
<th>Impedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit</td>
<td>25000 max Ω</td>
<td>10000 max Ω</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td>25000 max Ω</td>
<td>10000 max Ω</td>
</tr>
</tbody>
</table>

### Notes

- 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 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.
- Obtained preferably from a separate, well regulated source.
- With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

---

**a** Because the cathode is subjected to back bombardment, the frequency is increased with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz, heater volts = 32.5 (Approx.).

**b** Measured with special shield adapter.

**c** Mycalex Corporation of America, 125 Clifton Boulevard, Clifton, New Jersey.

**d** For use at higher frequencies.

**e** This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

**f** 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.

**g** With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

---

**Indicates a change.**
The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

Driver power output includes circuit losses and is the actual power measured as the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

Measured in a typical coaxial-cavity circuit.

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td></td>
<td>1.15</td>
<td>1.45</td>
<td>A</td>
</tr>
<tr>
<td>2. Direct Interelectrode</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>-</td>
<td>-</td>
<td>0.13</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>-</td>
<td>14.3</td>
<td>17.7</td>
<td>pF</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>-</td>
<td>0.0065 0.0155</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>-</td>
<td>20.8</td>
<td>25.2</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>-</td>
<td>5.7</td>
<td>7.1</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>-</td>
<td>2.0</td>
<td>3.0</td>
<td>pF</td>
</tr>
<tr>
<td>Cathode to heater</td>
<td>-</td>
<td>2.5</td>
<td>4.1</td>
<td>pF</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1,3</td>
<td>-8</td>
<td>-19</td>
<td>V</td>
</tr>
<tr>
<td>4. Reverse Grid-No.1 Current</td>
<td>1,3</td>
<td>-</td>
<td>-25</td>
<td>µA</td>
</tr>
<tr>
<td>5. Grid-No.2 Current</td>
<td>1,3</td>
<td>-7</td>
<td>+6</td>
<td>mA</td>
</tr>
<tr>
<td>6.Peak Emission</td>
<td>1,4</td>
<td>13</td>
<td>peak A</td>
<td></td>
</tr>
<tr>
<td>7. Interelectrode Leakage Resistance</td>
<td>5</td>
<td>1</td>
<td>-</td>
<td>MΩ</td>
</tr>
</tbody>
</table>

**Note 1:** With 13.5 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.

**Note 4:** For conditions with grid No.1, grid No.2, and plate tied together, and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 p/s. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.

**Note 5:** Under conditions 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 electrodes as measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1 megohm, will be 1 megohm.
**Note 1:** Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

**Note 2:** The diameters of the radiator, grid-No.2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

- Radiator to Grid-No.2 Terminal Contact Surface: 0.030 inch max
- Radiator to Pin Circle: 0.040 inch max
- Grid-No.2 Terminal Contact Surface to Pin Circle: 0.030 inch max

**Note 3:** The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of run-out and ellipticity.
TYPICAL COOLING REQUIREMENTS

Air flow directed through radiator from 1-1/2" OIA. Orifice located 1-1/2" from radiator. Plate core temperature - 250°C. Incoming air temperature - 24°C.

Plate Dissipation - Watts

Air Flow - Cubic Feet per Minute

DATA 3
Radio Corporation of America
Electronic Components and Devices
Harrison, N.J.
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 13.5
GRID NO. 2 VOLTS = 400
GRID NO. 1 VOLTS = E.G.

PLATE VOLS

PLATE AMPERES
HEATER VOLTS = 13.5
GRID- No. 2 VOLTS = 250
GRID- No. 1 VOLTS = $E_C$
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No. 2 VOLTS = 150
GRID-No. 1 VOLTS = $E_C$
TYPICAL CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No. 2 VOLTS = 250
GRID-No. 1 VOLTS = E_{C1}
I_{C1}
I_{C2}

PLATE VOLTS
GRID-No.1 (I_{C1}) OR GRID-No.2 (I_{C2}) MILIAMPERES

250
200
150
100
50

0 200 400 600 800

DATA 6
3-62

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No. 2 VOLTS = 150
GRID-No. 1 VOLTS = $E_{C1}$
$E_{C1}^* = +20$
$E_{C2}^* = +15$

GRID-No. 1 (Ic1) OR GRID-No. 2 (Ic2) MILLIAMPERES

PLATE VOLTS
**Beam Power Tube**

**FORCED-AIR COOLED**

**INTEGRAL RADIATOR**

**CERAMIC-METAL SEALS**

**380 WATTS PEP OUTPUT AT 30 MHz AB₁**

**COAXIAL ELECTRODE STRUCTURE**

**570 WATTS PEP OUTPUT AT 30 MHz AB₂**

**UNIPOTENTIAL CATHODE**

**300 WATTS CW OUTPUT AT 470 MHz**

For Use as an RF Power Amplifier, Oscillator, Regulator, Distributed Amplifier or Linear RF Power Amplifier in Mobile or Fixed Equipment

**ELECTRICAL**

**Heater, for Unipotential Cathode**

- Voltage (AC or DC): 13.5 ± 10% V
- Current at 13.5 volts: 1.3 A
- Minimum heating time: 60 s

**Mu-Factor, Grid No.2 to Grid No.1:** 12

Plate volts = 450, grid-No.2 volts = 325,
plate amperes = 1.2

**Direct Interelectrode Capacitances**

<table>
<thead>
<tr>
<th>Electrode</th>
<th>Capacitance (max)</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to plate</td>
<td>0.13</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>16</td>
<td>pF</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>0.011</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>24</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>7</td>
<td>pF</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>2.6</td>
<td>pF</td>
</tr>
<tr>
<td>Cathode to heater</td>
<td>3.4</td>
<td>pF</td>
</tr>
</tbody>
</table>

**MECHANICAL**

**Operating Position:** Any

**Maximum Overall Length:** 2.26 in

**Seated Length:** 1.920 ± 0.065 in

**Diameter:** 1.625 ± 0.015 in

**Weight (Approx.):** 3.5 oz

**Socket:** Erie® No.9802-000 and 9804-000, Johnson®

**Grid No.2 Bypass Capacitor:** Erie® No.2943-002, Johnson®

**Base:** Large-Wafer Elevenar II-Pin with Ring (JEDEC No.E11-81)

**TERMINAL DIAGRAM** (Bottom View)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cathode</td>
</tr>
<tr>
<td>2</td>
<td>Grid No.2</td>
</tr>
<tr>
<td>3</td>
<td>Grid No.1</td>
</tr>
<tr>
<td>4</td>
<td>Cathode</td>
</tr>
<tr>
<td>5</td>
<td>Heater</td>
</tr>
<tr>
<td>6</td>
<td>Heater</td>
</tr>
<tr>
<td>7</td>
<td>Grid No.2</td>
</tr>
<tr>
<td>8</td>
<td>Grid No.1</td>
</tr>
<tr>
<td>9</td>
<td>Cathode</td>
</tr>
<tr>
<td>10</td>
<td>Grid No.2</td>
</tr>
<tr>
<td>11</td>
<td>Grid No.1</td>
</tr>
<tr>
<td>C</td>
<td>CAP-Plate</td>
</tr>
<tr>
<td>H</td>
<td>CAP-Plate Terminal</td>
</tr>
<tr>
<td>R</td>
<td>RADIATOR-Plate</td>
</tr>
<tr>
<td>P</td>
<td>RADIATOR-Plate Terminal</td>
</tr>
<tr>
<td>G1</td>
<td>Grid-No.2 Terminal</td>
</tr>
<tr>
<td>G2</td>
<td>Grid-No.2 Contact Surface</td>
</tr>
</tbody>
</table>

**THERMAL**

**Terminal Temperature (All Terminals):** 250 max °C

**Radiator Core Temperature:** See Dimensional Outline. 250 max °C

**Air Flow:** (See accompanying Typical Cooling Requirements curve).
### 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage Up to 30 MHz</td>
<td>3000 V</td>
</tr>
<tr>
<td>DC Plate Voltage Up to 500 MHz</td>
<td>2200 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>450 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>400 W</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 W</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td>±150 V</td>
</tr>
</tbody>
</table>

**Typical CCS Operation at 30 MHz with "Two-Tone Modulation"**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB1 DC Plate Voltage</td>
<td>2000 V</td>
</tr>
<tr>
<td>AB2 DC Grid-No.2 Voltage</td>
<td>2500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-35 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>3050 V</td>
</tr>
<tr>
<td>DC Plate Current (peak)</td>
<td>335 mA</td>
</tr>
<tr>
<td>DC Plate Current (average)</td>
<td>250 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (peak)</td>
<td>6 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (average)</td>
<td>4 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (peak)</td>
<td>0.05 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (average)</td>
<td>3 mA</td>
</tr>
<tr>
<td>Output-Circuit Efficiency</td>
<td>0.3 W</td>
</tr>
<tr>
<td>Distortion Products Level</td>
<td>90 %</td>
</tr>
<tr>
<td>Third order</td>
<td>29 dB</td>
</tr>
<tr>
<td>Fifth order</td>
<td>32 dB</td>
</tr>
<tr>
<td>Useful Power Output (peak)</td>
<td>380 W</td>
</tr>
<tr>
<td>Useful Power Output (average)</td>
<td>190 W</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance Under Any Condition</td>
<td>25000 Ω</td>
</tr>
<tr>
<td>With fixed bias</td>
<td>100000 Ω</td>
</tr>
<tr>
<td>With cathode bias, AB1 operation</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Grid-No.2-Circuit Impedance</td>
<td>10000 Ω</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td>10000000 Ω</td>
</tr>
</tbody>
</table>

**PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony**

Carrier conditions per tube for use with a maximum modulation factor of 1

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage Up to 30 MHz</td>
<td>1800 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 V</td>
</tr>
</tbody>
</table>

---

**Data**

**RADIO CORPORATION OF AMERICA**  
Electronic Components and Devices  
Harrison, N. J.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Current</td>
<td>250 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>5 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>280 W</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>2200 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>8 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>400 W</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>175 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>25 V</td>
</tr>
<tr>
<td>Grid-No.1 Current</td>
<td>50 V</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1.2 W</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>120 W</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10 V</td>
</tr>
<tr>
<td>Grid-No.1 Current</td>
<td>30 V</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>5 W</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>100 W</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10 V</td>
</tr>
<tr>
<td>Grid-No.1 Current</td>
<td>30 V</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>5 W</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>100 W</td>
</tr>
</tbody>
</table>

### Maximum Circuit Values

- **Grid-No.1 Circuit Resistance Under Any Condition**
  - With fixed bias: 25000 Ω
- **Grid-No.2 Circuit Impedance**: 10000 Ω
- **Plate-Circuit Impedance**:

a. Because the cathode is subjected to back bombardment as the frequency increases with resultant increase in temperature, the heater voltage should, for optimum life, be reduced to a value such that at the heater voltage obtained at minimum supply voltage conditions (all other voltages constant) the tube performance just starts to show some degradation; e.g., at 470 MHz, heater volts = 12.5 (approx.).

b. Measured with special shield adapter.

c. Erie Technological Products, Inc., 645 West 12th Street, Erie, Pa.

d. E. F. Johnson Co., 1921 10th Ave. S.W. Waseca, Minn.

e. Mycalex Corporation of America, 775 Clifton Boulevard, Clifton.

f. For operation above 2200 plate volts, the tube shall see an effective plate-supply impedance of no less than 750 ohms. A fault current...
limiting resistor of no less than 15 ohms is to be used between the output filter capacitance and the tube plate. The plate-supply-output filter capacitance is to be no greater than 10 µF.

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 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

The value of third order distortion product level shown may be improved by approximately 5 dB by utilizing an unbypassed, non-inductive 20-ohm resistor between the cathode and ground; a slight increase in drive power will be required.

A fault current limiting resistor of no less than 20 ohms is to be used between the bias supply output filter capacitance and the tube grid-No.1. The bias supply output filter capacitance is to be no greater than 150 µF.

A fault current limiting resistor of no less than 320 ohms is to be used between the screen output filter capacitance and the tube screen. The screen supply output filter capacitance is to be no greater than 80 µF.

The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

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

See Electrical Considerations - Filament or Heater.

See Cooling Considerations - Forced-Air Cooling.

See Classes of Service.

### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current.</td>
<td></td>
<td>1.15</td>
<td>1.45</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate.</td>
<td>2</td>
<td>-</td>
<td>0.13</td>
</tr>
<tr>
<td>Grid No.1 to cathode.</td>
<td>2</td>
<td>14.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Plate to cathode.</td>
<td>2</td>
<td>0.0065</td>
<td>0.0155</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>2</td>
<td>20.8</td>
<td>25.2</td>
</tr>
<tr>
<td>Grid No.2 to plate.</td>
<td>2</td>
<td>5.7</td>
<td>7.1</td>
</tr>
<tr>
<td>Grid No.2 to cathode.</td>
<td>2</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Cathode to heater.</td>
<td>2</td>
<td>2.5</td>
<td>4.1</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1,8</td>
<td>-8</td>
<td>-19</td>
</tr>
<tr>
<td>4. Reverse Grid-No.1 Current</td>
<td>1,8</td>
<td>-</td>
<td>-26</td>
</tr>
<tr>
<td>5. Grid-No.2 Current</td>
<td>1,3</td>
<td>-7</td>
<td>+6</td>
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<tr>
<td>6. Peak Emission</td>
<td>1,4</td>
<td>13</td>
<td>peak</td>
</tr>
<tr>
<td>7. Interelectrode Leakage Resistance</td>
<td>5</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>8. Zero Bias Plate Current</td>
<td>1,6</td>
<td>1</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Note 1: With 13.5 volts ac or dc on heater.
Note 2: Measured with special shield adapter.
Note 3: With dc plate voltage at 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 mA.
Note 4: For conditions with grid No.1, grid No.2, and plate tied together; and pulse voltage source connected between plate and cathode. Pulse duration is 2.5 microseconds and pulse repetition frequency is 60 p/s. The voltage-pulse amplitude is 200 volts peak. After 1 minute at this value, the current-pulse amplitude will not be less than the value specified.
Note 5: Under conditions 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 electrodes as measured with a 200-ohm megger-type ohmometer having an internal impedance of 1 megohm, will be no less than the value specified.
Note 6: With dc plate voltage of 450 volts, dc grid-No.2 voltage of 400 volts, dc grid-No.1 voltage of -100 volts, grid drive voltage to zero. With pulse duration of 4500 to 5000 µs and pulse repetition frequency is 10 to 12 p/s.

→ Indicates a change.
NOTE 1: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR VOLUMES.

NOTE 2: THE DIAMETERS OF THE RADIATOR, GRID-No.2 TERMINAL CONTACT SURFACE, AND PIN CIRCLE TO BE CONCENTRIC WITHIN THE FOLLOWING VALUES OF MAXIMUM FULL INDICATOR READING:

- Radiator to Grid-No.2 Terminal Contact Surface: 0.030" max.
- Radiator to Pin Circle: 0.040" max.
- Grid-No.2 Terminal Contact Surface to Pin Circle: 0.030" max.

NOTE 3: THE FULL INDICATOR READING IS THE MAXIMUM DEVIATION IN RADIAL POSITION OF A SURFACE WHEN THE TUBE IS COMPLETELY ROTATED ABOUT THE CENTER OF THE REFERENCE SURFACE. IT IS A MEASURE OF THE TOTAL EFFECT OF RUN-OUT AND ELLIPTICITY.
Typical Cooling Requirements

- Air Flow: Cubic Feet per Minute
- Plate Dissipation: Watts (Solid Line)
- Plate Current: O.4 A
- Plate Voltage: 0.8 V
- Pressure Drop: Inches of Water (Dashed Line)

Note: Air Flow directed through radiator with Air Cline 50-60.
TYPICAL CHARACTERISTICS
For Grid-No.2 Voltage 400 Volts

HEATER VOLTS = 13.5
GRID-No.2 VOLTS = 400
GRID-No.1 VOLTS = EC1
IC1 = ——
IC2 = ——

PLATE VOLTS
0 200 400 600 800

GRID-No.1 (IC1) OR GRID-No.2 (IC2) MILLIAMPERES
0 50 100 150 200 250 300

DATA 4
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

For Grid-No.2 Voltage = 400 Volts

E/RATED VOLTS
GRID No. 2 VOLTS = 400
PLATE mA = I_b
GRID-No. 2 mA = I_{C_2}
GRID-No. 1 mA = I_{C_1}

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 5
10-66
TYPICAL CONSTANT-CURRENT CHARACTERISTICS
For Grid-No. 2 Voltage - 250 Volts

E1 = RATED VOLTS
GRID No. 2 VOLTS = 250
PLATE mA = I_b
GRID-No. 2 mA = I_c1
GRID-No. 1 mA = I_c2

DATA 5
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Beam Power Tube

CERAMIC-METAL SEALS
"ONE-PIECE" ELECTRODE DESIGN
COAXIAL-ELECTRODE STRUCTURE
INTEGRAL RADIATOR

2 MEGAWATT MAXIMUM PEAK POWER INPUT UP TO 500 Mc
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE
For use at Frequencies up to 500 Mc

GENERAL DATA

Electrical:
Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode

<table>
<thead>
<tr>
<th></th>
<th>Typical</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (AC or DC)</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Current at heater volts</td>
<td>12.6</td>
<td>25</td>
</tr>
<tr>
<td>Minimum heating time</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Mu-Factor, Grid No.2 to Grid No.1</td>
<td>0.3 max.</td>
<td>pf</td>
</tr>
<tr>
<td>for plate volts = 5000, grid-No.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>volts = 1400, and plate ma. = 500</td>
<td>110</td>
<td>pf</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
<td>0.03 max.</td>
<td>pf</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>1.5 max.</td>
<td>pf</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mechanical:
Operating Position: Any
Maximum Overall Length: 7.24"
Maximum Diameter: 5.56"
Weight (Approx.): 8.5 lbs
Radiator: Integral part of tube

Terminal Connections (See Dimensional Outline):

- G1 - Grid-No-1 -
  - Terminal Contact
  - Surface
- G2 - Grid-No.2 -
  - Terminal Contact
  - Surface
- H - Heater -
  - Terminal Contact
  - Surface
- H,K - Heater- & Cathode-
  - Terminal Contact
  - Surface
- P - Plate-
  - Terminal Contact
  - Surface

Thermal:
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 heater, plate, grid-No.2, and grid-No.1 voltages. Typical
values of air flow directed through the radiator versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curve.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals—A sufficient quantity of air should be allowed to flow past each of these terminals to prevent their temperature from exceeding the specified maximum value of 250°C.

Plate power, grid-No.2 power, heater power, and the forced-air flow may be removed simultaneously.

Terminal Temperatured (Plate, grid No.2, grid No.1, cathode, and heater) ... 250 max. °C
Plate Core Temperatured ... 250 max. °C

PULSED RF AMPLIFIER

Maximum CCS® Ratings, Absolute-Maximum Values:

For maximum "on" time of 10 microseconds in any 2000-microsecond interval and frequencies up to 500 Mc

PEAK POSITIVE PULSE PLATE VOLTAGE........................................ 25000 max. volts
DC PLATE VOLTAGE........................................................... 15000 max. volts
POSITIVE-PULSE GRID-No.2 VOLTAGE:
   Peak........................................... 2500 max. volts
   DC............................................... 2500 max. volts
NEGATIVE-PULSE GRID-No.1 VOLTAGE:
   Peak........................................... 500 max. volts
   DC............................................... 500 max. volts
DC-PULSE PLATE CURRENT......................................................
DC PLATE CURRENT...........................................................
GRID-No.2 INPUT (Average)..............................................
GRID-No.1 INPUT (Average)..............................................
PLATE DISSIPATION (Average)..............................................

Maximum Circuit Values:

Grid-No.1-Circuit Resistance under any condition........................................ 2000 max. ohms

See Operating Considerations.
With external flat metal shield 8" diameter having center hole 4" diameter. Shield is located in plane of the grid-No.2 terminal, perpendicular to the tube axis, and is connected to grid No.2 and ground.
With external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No.1 terminal, perpendicular to the tube axis, and is connected to grid No.1 and ground.
See Operating Considerations and also Dimensional Outline for temperature-measurement points.
Continuous Commercial Service.
"On" time is defined as the sum of the durations of all the individual pulses which occur during the interval. An increase in DC plate current during the pulse may be permissible at shorter "on" times, and a decrease is usually required at longer "on" times. Pulse duration is defined as the time interval between the two points on the pulse at which the instantaneous value is 70 per cent of the peak value. Peak value is defined as the maximum value of a smooth curve through the average of the fluctuations over the too portion of the pulse. Duty factor is defined as the ratio of "on" time to total elapsed time in any interval.
Pressurization may be required when the tube is used at high altitudes and plate voltages near the maximum rating to prevent flash-over at the tube seals.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>11.7</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No. 1 to plate</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>Grid No. 1 to cathode &amp; heater</td>
<td>91</td>
<td>113</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td>2.3</td>
<td>0.03</td>
</tr>
<tr>
<td>Grid No. 1 to grid No. 2</td>
<td>99</td>
<td>121</td>
</tr>
<tr>
<td>Grid No. 2 to plate</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Grid No. 2 to cathode &amp; heater</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Grid-No. 1 Voltage</td>
<td>1.4</td>
<td>-27</td>
</tr>
<tr>
<td>Grid-No. 1 Cutoff Voltage</td>
<td>1.5</td>
<td>-95</td>
</tr>
</tbody>
</table>

Note 1: With 22 volts ac or dc on heater.
Note 2: With external flat metal shield 8" diameter having center hole 3/8" diameter. Shield is located in plane of the grid-No. 2 terminal, perpendicular to the tube axis, and is connected to grid No. 2 and ground.
Note 3: With external flat metal shield 8" diameter having center hole 3-3/8" diameter. Shield is located in plane of the grid-No. 1 terminal, perpendicular to the tube axis, and is connected to grid No. 1 and ground.
Note 4: With dc plate voltage of 5000 volts, dc grid-No. 2 voltage of 1300 volts, and dc grid-No. 1 voltage adjusted to give a plate current of 500 ma.
Note 5: With dc plate voltage of 5000 volts, dc grid-No. 2 voltage of 1500 volts, and dc grid-No. 1 voltage adjusted to give a plate current of 20 ma.

OPERATING CONSIDERATIONS

Heater

The heater of the 8184 should be operated at constant voltage rather than constant current. The rated heater voltage of 22 volts should be applied for 5 minutes to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes. Good regulation of the heater voltage is in general economically advantageous from the viewpoint of tube life; in no case should the voltage fluctuations be more than 5%.

Temperature

The maximum terminal temperature of 250°C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. The latter is made in the form of liquid and stick by the Tempil Corporation, 132 West 22nd Street, New York II, N.Y.

Standby Operation

During long or frequent standby periods, the 8184 may be operated at decreased heater voltage to conserve life. It is recommended that the heater voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the heater voltage should be turned off.
Precautions

The maximum-rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock devices should function to break the primary circuit of the high-voltage supplies when any gate or door on the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.

NOTE 1: SEE SKETCH GI FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8184 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.

NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNULAR REGIONS.

NOTE 4: THE HEATER TERMINAL IS DIMENSIONED FOR INSIDE DIAMETER AND OUTSIDE DIAMETER TO PROVIDE A CHOICE OF CONTACT MOUNTING; THE DIMENSIONS SHALL NOT BE CONSIDERED CONCURRENTLY.

SKETCH G1

OPENING FOR:

RADIATOR 5.625"

PLATE TERMINAL 4.263

GRID—No. 2 TERMINAL 3.985

GRID—No. 1 TERMINAL 3.335

HEATER—CATHODE TERMINAL 2.730

HEATER TERMINAL (INNER) 1.935

HEATER TERMINAL (OUTER) 2.130

ALL DIMENSIONS IN INCHES
SUGGESTED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

NOTE 1: FINGER STOCK NO.97-310.
NOTE 2: FINGER STOCK NO.97-139.
NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.
TYPICAL COOLING REQUIREMENTS

AIR FLOW THROUGH RADIATOR IN EITHER AXIAL DIRECTION. MAXIMUM PLATE CORE TEMPERATURE = 250°C

<table>
<thead>
<tr>
<th>CURVE</th>
<th>AIR FLOW CFM</th>
<th>APPROX PRESSURE DROP ACROSS RADIATOR INCHES OF WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92</td>
<td>0.8</td>
</tr>
<tr>
<td>B</td>
<td>156</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>200</td>
<td>3.2</td>
</tr>
<tr>
<td>D</td>
<td>236</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>267</td>
<td>5.6</td>
</tr>
</tbody>
</table>

EXAMPLE: MAXIMUM TEMPERATURE RISE (205°C) WHEN INCOMING-AIR TEMPERATURE IS 45°C — (250°C - 45°C).
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 22
GRID — No. 2 VOLTS = 1500
GRID — No. 1 VOLTS = E2
NUVISTOR TYPE

ALL-CERAMIC-AND-METAL CONSTRUCTION

For Class C RF Power Amplifier and Oscillator Service, DC Pulse-Amplifier and Frequency-Multiplier Tube Applications, Including Use in Equipment in which Ability to Withstand Severe Mechanical Shock and Vibration, Compactness, and Exceptional Uniformity of Characteristics are Primary Requirements.

Electrical:

Heater Characteristics and Ratings:

Voltage (AC or DC) ........................................ 6.3 ±0.6 volts
Current at 6.3 volts ........................................ 0.160 amp
Peak heater-cathode voltage (CCS\textsuperscript{a} or ICAS\textsuperscript{b} conditions):
  Heater negative with respect to cathode .................................. 100 max. volts
  Heater positive with respect to cathode .................................. 100 max. volts

Direct Interelectrode Capacitances (Approx.):

  Grid to plate ............................................ 2.2 pf
  Input: G to (K,S,H) ........................................ 4.2 pf
  Output: P to (K,S,H) ........................................ 1.6 pf
  Cathode to plate ........................................... 0.26 pf
  Heater to cathode ......................................... 1.5 pf

Mechanical:

Operating Position ........................................ Any
Type of Cathode ........................................... Coated Unipotential
Maximum Overall Length .................................. 0.800"
Maximum Seated Length .................................. 0.625"
Maximum Diameter ........................................ 0.440"
Weight (Approx.) .......................................... 1.9 grams
Envelope .................................................. Metal Shell MT4
Socket ...................................................... See Socket & Connector Information for RCA Nuvistor Tubes at front of this Section
Base ....................................................... Medium Ceramic-Wafer Twelvar 5-Pin (JEDEC No.E5-65)
Basing Designation for BOTTOM VIEW .................. 12AQ

Pin 1\textdegree - Do Not Use
Pin 2 - Plate
Pin 3\textdegree - Do Not Use
Pin 4 - Grid
Pin 5\textdegree - Do Not Use
Pin 6\textdegree - Do Not Use
Pin 7\textdegree - Do Not Use
Pin 8 - Cathode
Pin 9\textdegree - Do Not Use
Pin 10 - Heater
Pin 11 - Omitted
Pin 12 - Heater
### Class A Amplifier Characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Supply Voltage</td>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td>Grid Supply Voltage</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cathode Resistor</td>
<td>100</td>
<td>560</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Plate Resistance (Approx.)</td>
<td>2700</td>
<td>5000</td>
</tr>
<tr>
<td>Transconductance</td>
<td>13000</td>
<td>6000</td>
</tr>
<tr>
<td>Plate Current</td>
<td>11.5</td>
<td>-6.5</td>
</tr>
<tr>
<td>Grid Voltage (Approx.) for plate $\mu_a = 10.$</td>
<td>-15</td>
<td></td>
</tr>
</tbody>
</table>

### RF Power Amplifier & Oscillator — Class C Telegraphy

### RF Power Amplifier — Class C FM Telephony

#### Maximum Ratings, Absolute-Maximum Values:

For operation at frequencies up to 250 Mc

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Supply Voltage</td>
<td>400 max.</td>
<td>400 max.</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250 max.</td>
<td>300 max.</td>
</tr>
<tr>
<td>DC Grid Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative-bias value</td>
<td>100 max.</td>
<td>100 max.</td>
</tr>
<tr>
<td>Positive-bias value</td>
<td>0 max.</td>
<td>0 max.</td>
</tr>
<tr>
<td>Peak-Positive Grid Voltage</td>
<td>5 max.</td>
<td>5 max.</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>25 max.</td>
<td>30 max.</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5 max.</td>
<td>6 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1.5 max.</td>
<td>1.8 max.</td>
</tr>
</tbody>
</table>

#### Typical CCS Operation:

As rf power amplifier in cathode-drive circuit at 160 Mc

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>From a grid resistor of.</td>
<td>2700</td>
<td></td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>1.55 $^f$</td>
<td></td>
</tr>
</tbody>
</table>

As rf oscillator at 160 Mc

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-3.4</td>
<td></td>
</tr>
<tr>
<td>From a grid resistor of.</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.8 $^f$</td>
<td></td>
</tr>
</tbody>
</table>

#### Maximum Circuit Values:

Grid-Circuit Resistance (CCS or ICAS conditions): $^g$

For fixed-bias or cathode-bias operation, 50000 max. ohms
FREQUENCY MULTIPLIER

Maximum Ratings, Absolute-Maximum Values:
For operation at frequencies up to 250 Kc

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Supply Voltage</td>
<td>400° max.</td>
<td>400° max.</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250° max.</td>
<td>250° max.</td>
</tr>
<tr>
<td>DC Grid Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative-bias value.</td>
<td>200 max.</td>
<td>200 max.</td>
</tr>
<tr>
<td>Positive-bias value.</td>
<td>0 max.</td>
<td>0 max.</td>
</tr>
<tr>
<td>Peak-Positive Grid Voltage</td>
<td>5 max.</td>
<td>5 max.</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>20 max.</td>
<td>24 max.</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>3 max.</td>
<td>4 max.</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1.3 max.</td>
<td>1.5 max.</td>
</tr>
</tbody>
</table>

Typical CCS Operation:
As a doubler from 80 to 160 Kc

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>125 volts</td>
</tr>
<tr>
<td>DC Grid Voltage.</td>
<td>-70 volts</td>
</tr>
<tr>
<td>From a grid resistor of.</td>
<td>18000 ohms</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>22 ma</td>
</tr>
<tr>
<td>DC Grid Current.</td>
<td>4 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.).</td>
<td>0.25 watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.).</td>
<td>0.85f watt</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:
Grid-Circuit Resistance (CCS or ICAS conditions):
For fixed bias or cathode-bias operation . 50000 max. ohms

DC PULSE AMPLIFIER

Maximum Ratings, Absolute-Maximum Values:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Positive-Pulse Plate Voltage</td>
<td>500° max.</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250° max.</td>
</tr>
<tr>
<td>DC Grid Voltage:</td>
<td></td>
</tr>
<tr>
<td>Negative-bias value.</td>
<td>100 max.</td>
</tr>
<tr>
<td>Positive-bias value.</td>
<td>0 max.</td>
</tr>
<tr>
<td>Peak Positive Grid Voltage</td>
<td>5 max.</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>5 max.</td>
</tr>
<tr>
<td>DC Cathode Current.</td>
<td>18 max.</td>
</tr>
<tr>
<td>Peak Cathode Current:</td>
<td>250 max.</td>
</tr>
<tr>
<td>For duty factors up to 1 per cent.</td>
<td>250 max. ma</td>
</tr>
<tr>
<td>For duty factors between 1 and 50 per cent..</td>
<td>See Pulse Rating Chart</td>
</tr>
<tr>
<td>Plate Dissipation.</td>
<td>1 max.</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:
Grid-Circuit Resistance:
For fixed-bias operation . 0.5 max. megohm
For cathode-bias operation . 1 max. megohm

---

a continuous Commercial Service.
b Intermittent Commercial and Amateur Service. No operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or stand-by period of the same or greater duration.
c Pins 1,3,5,6,7, and 9 are of a length such that their ends do not touch the socket insertion plane.
d Key-down conditions per tube without amplitude modulation. Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115 percent of the carrier conditions.
e Under no circumstances should this absolute-maximum value be exceeded. For high-altitude operation the maximum permissible plate-supply voltage and plate voltage for the 8203 are dependent on atmospheric pressure. See accompanying graph of Low-Pressure Voltage-Breakdown Characteristics of Nuistor Triode Base.
f Measured at load of output circuit.
g For operation at metal-shell temperature of 150°C. For operation at other metal-shell temperatures, see accompanying Grid-Circuit Resistance Rating Chart. Metal-shell temperatures are measured in Zone "A" as shown on accompanying Dimensional Outline.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Note 1</th>
<th>Min.</th>
<th>Max.</th>
<th>amp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td></td>
<td>1</td>
<td>0.150</td>
<td>0.170</td>
<td></td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>pf</td>
<td>2</td>
<td>1.8</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Input: G to (K,S,H)</td>
<td></td>
<td>2</td>
<td>3.8</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>Output: P to (K,S,H)</td>
<td></td>
<td>2</td>
<td>1.4</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Cathode to plate</td>
<td></td>
<td>2</td>
<td>0.20</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Heater to cathode</td>
<td></td>
<td>2</td>
<td>1.2</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>ma</td>
<td>1,3</td>
<td>5.0</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>μA</td>
<td>1,4</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Transconductance</td>
<td>μhos</td>
<td>1,3</td>
<td>4000</td>
<td>8000</td>
<td></td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>μA</td>
<td>1,5</td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>AC Emission</td>
<td>ma</td>
<td>6,7</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>ma</td>
<td>1,3</td>
<td>20</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Heater-Cathode Leakage Current:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
<td></td>
<td>1,8</td>
<td>-</td>
<td>5</td>
<td>μA</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
<td></td>
<td>1,8</td>
<td>-</td>
<td>5</td>
<td>μA</td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between grid and all other electrodes tied together</td>
<td></td>
<td>1,9</td>
<td>1000</td>
<td>-</td>
<td>megohms</td>
</tr>
<tr>
<td>Between plate and all other electrodes tied together</td>
<td></td>
<td>1,10</td>
<td>1000</td>
<td>-</td>
<td>megohms</td>
</tr>
<tr>
<td>Usefull Power Output</td>
<td>watt</td>
<td>1,11</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Cathode Emission Current (Pulsed)</td>
<td></td>
<td>1,12</td>
<td>250</td>
<td>-</td>
<td>ma</td>
</tr>
</tbody>
</table>

Note 1: with ac or dc heater volts = 6.3.  
Note 2: Measured in accordance with EIA Standard RS-191-A.  
Note 3: with dc plate supply volts = 150, dc grid supply volts = 0, cathode resistor (ohms) = 560, cathode-bypass capacitor (μF) = 1000, and metal shell connected to ground.  
Note 4: with dc plate volts = 150, dc grid volts = -15, and metal shell connected to ground.  
Note 5: with dc plate supply volts = 100, dc grid supply volts = 1.7, grid-circuit resistance (megohms) ≤ 1 (the internal resistance of the current meter used for this measurement), and metal shell connected to ground.
Note 6: with ac or dc heater volts = 5.5.

Note 7: with dc plate supply volts = 50, dc grid supply volts = -5.7, 60-cps grid-signal volts (rms) = 7.5, dc resistance of transformer secondary winding in grid circuit ≤ 2 ohms, grid-voltage-supply bypass capacitor (µF) = 1000, and metal shell connected to ground. AC emission is measured as the dc component of plate current at these conditions.

Note 8: with dc heater-cathode volts = 100.

Note 9: with grid 100 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 10: with plate 300 volts negative with respect to all other electrodes tied together, and metal shell connected to ground.

Note 11: Measured at load in 250-Mc rf amplifier circuit with dc plate supply volts = 150, grid resistor (ohms) = 4700, driver power output (milliwatts) = 350, and plate milliamperes = 20.

Note 12: with dc plate supply volts = 250 and dc grid supply volts = -20. The grid is driven with pulse voltage, as follows: peak volts between grid and negative end of cathode resistor = 5, pulse repetition rate = 1000, pulse duration = 10 µs, pulse rise time ≤ 1 µs, and time of fall ≤ 1 µs. Peak cathode current is measured with a high impedance oscilloscope or equivalent device connected across a 1-ohm cathode resistor.

SPECIAL TESTS

Shock:
Peak Impact Acceleration. . . . . . . . . . . 1000 g
This test is performed on a sample lot of tubes to determine the ability of the tube to withstand the specified Peak Impact Acceleration. Tubes are held rigid in each of four positions (X1, X2, Y1, and Y2) in a Navy Type, High-Impact (Flyweight) Shock Machine, and, with tube electrode voltages applied, are subjected to 20 blows (5 in each position) at the specified Peak Impact Acceleration.

At the end of this test, tubes are criticized for Shorts and Continuity, Change in Transconductance, Reverse Grid Current, Heater-Cathode Leakage Current, and Variable-Frequency Vibration.

Variable-Frequency Vibration:
This test is performed on a sample lot of tubes operated under the conditions specified in CHARACTERISTICS RANGE VALUES for Transconductance, with the addition of a plate-load resistor of 2000 ohms. During operation, tube is vibrated in the X1 position through the frequency range of 3000 to 15000 cycles per second with a constant vibrational acceleration of 1g. During the test, tube must not show an rms output voltage across the plate-load resistor in excess of:

25 millivolts over the frequency range of 3000 to 6000 cps
500 millivolts over the frequency range of 6000 to 15000 cps

Post-Impact and Post-Sweep-Frequency Fatigue Vibration limits:
35 millivolts over the frequency range of 3000 to 6000 cps
700 millivolts over the frequency range of 6000 to 15000 cps
**Sweep-Frequency Fatigue Vibration:**

This test is performed on a sample lot of tubes with only heater voltage of 6.3 volts applied. During operation, the tube is rigidly mounted and is vibrated through the frequency range of 5 to 500 cps and back to 5 cps. One such vibration sweep cycle takes approximately 15 minutes. The tubes are vibrated for a period of 3 hours along each of 3 mutually perpendicular axes for a total of 9 hours. The longitudinal axis of the tube is coincident with one of the 3 axes. The vibrations are applied as follows:

a. From 5 to 50 cps with a constant peak-to-peak displacement of 0.080 inch.
b. From 50 to 500 cps with a constant acceleration of 10 g.
c. From 500 to 50 cps and then to 5 cps follows the procedure shown in a and b, but in reverse.

At the end of this test, tubes are criticized for Shorta and Continuity, Change in Transconductance, Reverse Grid Current, Heater-Cathode Leakage Current, and Vibration-Frequency-Vibration.

**Low-Pressure Voltage Breakdown:**

This test is performed on a sample lot of tubes to determine the ability of the tube to withstand high-altitude (low-air-pressure) conditions. Tubes are operated with 250 rms volts applied between the plate and all other electrodes and metal shell connected together. The tubes must not break down or show evidence of corona when subjected to air pressure equivalent to an altitude of 100,000 feet (8.0 ± 0.5 mm Hg).

**Shorts and Continuity:**

This test is performed on a sample lot of tubes from each production run. Tubes are subjected to the Thyatron-Type Shorts Test described in MIL-E-115, Amendment 2, Paragraph 4.7.7, except that tapping is done by hand with a soft rubber tapper (Specifications for this tapper will be supplied on request). The areas of acceptance and rejection for this test are shown in the accompanying graph, Shorts-Test Acceptance Limits. Tubes are criticized for permanent or temporary shorts and open circuits.

**Intermittent Conduction Life (1000 hours):**

This test is performed on a sample lot of tubes from each production run to assure the high quality of individual tubes and to prevent epidemic failures due to excessive changes in tube characteristics. Tubes are operated with heater voltage of 6.3 volts cycled 110 minutes on and 10 minutes off, and plate dissipation = 1.5 watts (approx.), at a shell temperature of 150°C.

Tubes are criticized at 2 hours, 20 hours, and 100 hours for inoperatives and Transconductance, and at 500 hours and 1600 hours for inoperatives and Useful Power Output at 250 Mc.
Oscillator Life (1000 hours):

This test is performed on a sample lot of tubes to assure satisfactory operation of the tube as a 250-Mc oscillator. Tubes are operated with heater volts = 6.3 and plate dissipation = 1.4 watts.

Tubes are criticized at 500 and 1000 hours for Inoperatives and Useful Power Output at 250 Mc.

Grid Pulse Life (1000 hours):

This test is performed on a sample lot of tubes from each production lot. Tubes are operated with heater voltage of 6.3 volts cycled 110 minutes on and 10 minutes off, dc plate supply volts = 300, dc grid supply volts = -20, grid resistor (ohms) = 47, and plate-load resistor (ohms) = 330. The grid is driven with pulse voltage, as follows: peak grid-to-cathode volts = 5, pulse repetition rate = 1000, pulse duration = 10 µs, pulse rise time < 1 µs, and time of fall < 2 µs.

Tubes are tested at 500 hours and 1000 hours for Inoperatives and Peak Cathode Emission Current (Pulsed).

h An inoperative is defined as a tube having a discontinuity, permanent short, or air leak.

---

**SHORTS-TEST ACCEPTANCE LIMITS**

- **Area of Rejection**
- **Area of Acceptance**

**RESISTANCE OF SHORT — KILOHMS**

**DURATION OF SHORT — MICROSECONDS**

**PULSE REPEITION RATE — PER SECOND**

**PULSE DURATION — MICROSECONDS**

---

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 4
8-64
Dimensions in inches:

- Maximum outside diameter of 0.440" is permitted along 0.190" lug length.
- Metal-shell temperature should be measured in zone "A".

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
AVERAGE PLATE CHARACTERISTICS

$E_f = 6.3 \text{ VOLTS}$

PLATE MILLIAMPERES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
DATA 5
8-64
AVERAGE CHARACTERISTICS

$E_f = 6.3$ VOLTS

PLATE ($I_b$) OR GRID ($I_c$) MILLIAMPERES

PLATE VOLTS

GRID VOLTS, $E_c = 3$

GRID VOLTS, $E_c = 2$

GRID VOLTS, $E_c = 1$

GRID VOLTS, $E_c = 0$

GRID VOLTS, $E_c = -1$

GRID VOLTS, $E_c = -2$

GRID VOLTS, $E_c = -3$

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
LOW PRESSURE VOLTAGE BREAKDOWN CHARACTERISTICS OF NUVISITOR TRIODE BASE

AC BREAKDOWN VOLTS (RMS)

PRESSURE — mm Hg

ALTITUDE — THOUSANDS OF FEET

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
**GRID-CIRCUIT-RESISTANCE RATING CHART**

- **For DC Pulse-Amplifier Service**
- **For RF-Power Amplifier & Oscillator and Frequency-Multiplier Service**

**PULSE RATING CHART**

- **Maximum Pulse Duration** — μs
- **Duty Factor** — The ratio of average cathode current to maximum peak cathode current occurring in any 1000 μs period.

**MAXIMUM PEAK CATHODE MILLIAMPERES**

**MAXIMUM PULSE DURATION — μs**

**AREA OF PERMISSIBLE OPERATION**

---

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.

DATA 7

8–64
Beam Power Tube

FORCED-AIR COOLED
INTEGRAL RADIATOR
MATRIX-TYPE CATHODE

CERMOLOX®
HIGH GAIN-BANDWIDTH PRODUCTS
340 WATTS CW POWER OUTPUT AT 400 Mc
105 WATTS CW POWER OUTPUT AT 1215 Mc

For Compact Aircraft, Mobile, and Stationary Equipment Applications in the UHF Frequency Range

GENERAL DATA

Electrical:
- Heater, for Matrix-Type, Oxide-Coated, Unipotential Cathode:
  - Voltage (AC or DC) = 6.3 volts
  - Current at heater volts = 6.3 = 3.2 amp
  - Minimum heating time = 60 sec
- Mu-Factor, Grid No.2 to Grid No.1 for plate volts = 250, grid-No.2 volts = 250, and plate ma. = 100.
  - 18
- Direct Interelectrode Capacitances:
  - Grid No.1 to plate = 0.065 max. pf
  - Grid No.1 to cathode & heater = 15 pf
  - Plate to cathode & heater = 0.019 max. pf
  - Grid No.1 to grid No.2 = 20 pf
  - Grid No.2 to plate = 3.2 pf
  - Grid No.2 to cathode & heater = 1.30 max. pf

Mechanical:
- Operating Position: Any
- Overall Length: 2.620" ± 0.090"
- Greatest Diameter (See Dimensional Outline): 1.625" ± 0.015"
- Weight (Approx.): 4 oz
- Radiator: Integral part of tube

Terminal Connections (See Dimensional Outline):

- G1 - Grid-No.1 - Terminal Contact Surface
- G2 - Grid-No.2 - Terminal Contact Surface
- H - Heater Terminal Contact Surface
- H, K - Heater & Cathode Terminal Contact Surface
- P - Plate Terminal Contact Surface

Thermal:
- Plate, Grid No.2, Grid No.1, Cathode, and Heater Temperature°C = 250 max. °C
- Radiator Core Temperature°C = 250 max. °C
Air Flow:  
Through radiator — Adequate air flow to limit the radiator core temperature to 250°C should be delivered by a blower through the radiator before and during the application of plate, grid-No.2, and grid-No.1 voltages. Typical values of air flow directed through the radiator versus plate dissipation are shown in accompanying Typical-Cooling-Requirements curve.

To Plate, Grid-No.2, Grid-No.1, Cathode, and Heater Terminals — A sufficient quantity of air should be directed at the heater terminal and 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 not usually required when only heater voltage is applied to the tube.

Plate Power, Grid-No.2 Power, Heater Power, and Air Flow — These may be removed simultaneously.

At Sea Level — Cooling requirements, with air flow directed through the radiator as shown in accompanying Typical-Cooling-Requirements curve, may be met by use of the following blowers and associated motors manufactured by Rotron Manufacturing Company Incorporated, Woodstock, New York, or equivalent:

For 100% Plate Dissipation:

<table>
<thead>
<tr>
<th>Blower Model No.</th>
<th>KS-250I</th>
<th>AS-250I</th>
<th>AXIMAX I</th>
<th>AXIMAX I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Model No.</td>
<td>165AS</td>
<td>323JS</td>
<td>464YS</td>
<td>499JS</td>
</tr>
<tr>
<td>Phase (φ)</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Frequency (cps)</td>
<td>60</td>
<td>60</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Voltage (v)</td>
<td>115</td>
<td>220</td>
<td>115</td>
<td>200</td>
</tr>
</tbody>
</table>

For 80% Plate Dissipation:

<table>
<thead>
<tr>
<th>Blower Model No.</th>
<th>KS-201I</th>
<th>AS-201I</th>
<th>AXIMAX I</th>
<th>AXIMAX I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Model No.</td>
<td>92AS</td>
<td>323JS</td>
<td>464YS</td>
<td>499JS</td>
</tr>
<tr>
<td>Phase (φ)</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Frequency (cps)</td>
<td>60</td>
<td>60</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Voltage (v)</td>
<td>115</td>
<td>220</td>
<td>115</td>
<td>200</td>
</tr>
</tbody>
</table>

For 60% Plate Dissipation:

<table>
<thead>
<tr>
<th>Blower Model No.</th>
<th>KS-1504</th>
<th>AS-1504</th>
<th>AXIMAX I</th>
<th>AXIMAX I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Model No.</td>
<td>92AS</td>
<td>323JS</td>
<td>464YS</td>
<td>499JS</td>
</tr>
<tr>
<td>Phase (φ)</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Frequency (cps)</td>
<td>60</td>
<td>60</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Voltage (v)</td>
<td>115</td>
<td>220</td>
<td>115</td>
<td>200</td>
</tr>
</tbody>
</table>

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCSd Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>DC PLATE VOLTAGE</th>
<th>2500 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max. volts</td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-200 max. volts</td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>250 max. ma</td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>30 max. ma</td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>10 max. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>300 max. watts</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electron Tube Division  Harrison, N. J.
Typical CCS Operation:

In cathode-drive circuit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>400</td>
<td>1215</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>2500</td>
<td>1250</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-15</td>
<td>-30</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Output-Circuit Efficiency</td>
<td>90</td>
<td>60</td>
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<tr>
<td>Useful Power Output</td>
<td>340</td>
<td>105</td>
</tr>
</tbody>
</table>

Maximum Circuit Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance</td>
<td>30000</td>
<td>max.</td>
</tr>
<tr>
<td>Grid-No.2 Circuit Impedance</td>
<td>10000</td>
<td>max.</td>
</tr>
<tr>
<td>Plate Circuit Impedance</td>
<td></td>
<td>k</td>
</tr>
</tbody>
</table>

a See Operating Considerations under Heater.
b Measured with special shield adapter.
c See Operating Considerations under temperature and also Dimensional Outline for temperature measurement points.
d Continuous Commercial Service.
e See Operating Considerations under Grid No. 2.
f Obtained preferably from fixed supply and grid-No.1 resistor. Sufficient voltage should be provided from fixed supply to protect the tube in case of drive loss.
g Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.
h Measured in a typical coaxial-cavity circuit.
i For Minimum Useful Power Output value, see Characteristics Range Values, Test No. 6.
j See Operating Considerations under Precautions.
k See Operating Considerations under Precautions.

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td>1</td>
<td>2.90</td>
<td>3.55</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.065</td>
</tr>
<tr>
<td>Grid No.1 to cathode &amp; heater</td>
<td>2</td>
<td>13.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Plate to cathode &amp; heater</td>
<td>2</td>
<td>-</td>
<td>0.019</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>2</td>
<td>16.8</td>
<td>22.2</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>2</td>
<td>2.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Grid No.2 to cathode &amp; heater</td>
<td>2</td>
<td>-</td>
<td>1.30</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1,3</td>
<td>-6.5</td>
<td>-20.5</td>
</tr>
<tr>
<td>4. Grid-No.1 Cutoff Voltage</td>
<td>1,4</td>
<td>-</td>
<td>-65</td>
</tr>
<tr>
<td>5. Reverse Grid-No.1 Current</td>
<td>1,3</td>
<td>-</td>
<td>-20</td>
</tr>
<tr>
<td>6. Grid-No.2 Current</td>
<td>1,3</td>
<td>-8</td>
<td>+2</td>
</tr>
</tbody>
</table>
Test No. | Note | Min. | Max.  
---|---|---|---
7. Interelectrode Leakage Resistance: Between plate and all other electrodes . . . . | 5 | 10 | - megohms  
Between any two electrodes except plate. . . | 5 | 1 | - megohms
8. Useful Power Output: . . . . | 6 | 300 | - watts

Note 1: With 6.3 volts ac or dc on heater.  
Note 2: Measured with special shield adapter.  
Note 3: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 300 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 120 ma.  
Note 4: With dc plate voltage of 2500 volts, dc grid-No.2 voltage of 400 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 2.5 ma.  
Note 5: Under conditions with tube at 20° to 30° C without any voltages applied to the tube, the resistance between the two electrodes is measured with a 200-volt Megger-type ohmmeter having an internal impedance of 1.0 megohm.  
Note 6: In a single-tube, cathode-driven coaxial-cavity class C amplifier circuit at 400 Mc and for conditions with 5.7 volts ac or dc on heater, dc plate voltage of 2500 volts and driver power output of 5 watts, dc grid-No.2 voltage of 250 volts, grid-No.1 voltage and tuning circuit are adjusted for maximum power output with plate current not to exceed 250 ma and grid-No.1 current not to exceed 20 ma.

OPERATING CONSIDERATIONS

Heater

The heater of the 8226 should be operated at constant voltage rather than constant current. The rated heater voltage of 6.3 volts should be applied for 60 seconds to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can be conserved by operating at the lowest heater supply voltage which will give the desired performance. Good regulation of the heater supply voltage is, in general, economically advantageous from the viewpoint of tube life; in no case should the voltage fluctuations be more than 5%. This recommendation is particularly applicable at the higher operating frequencies.

Temperature

The maximum radiator core or electrode temperature of 250° C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. This paint is manufactured in the form of liquid or stick by the Tempil Corporation, 132 West 22nd Street, New York II, N.Y.

Grid No.2

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary emission phenomena. Because it is the net result of these component
currents which is read on a meter in the grid-No. 2 circuit, grid-No. 2 dissipation cannot be accurately determined. Operation similar to conditions given under Typical Operation in the tabulated data section will minimize the possibility of exceeding maximum grid-No. 2 input rating.

The grid-No. 2 circuit must be capable of maintaining the proper grid-No. 2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No. 2-to-ground impedance that is low enough to prevent gradual build-up of grid-No. 2 voltage and/or catastrophic build-up (runaway) under negative current conditions, and a current overload relay to protect the grid No. 2 against positive or negative currents of the order of one-tenth the required plate current.

Standby Operation

During long or frequent standby periods, the 8226 may be operated at decreased heater voltage to conserve life. It is recommended that the heater voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the heater voltage should be turned off.

Precautions

In beam power tubes with closely spaced electrodes, such as the 8226, extremely high voltage gradients occur even with moderate tube operating voltages. Any arc-over between electrodes may be destructive. A series impedance in the plate lead is recommended. The resultant plate impedance giving a plate-voltage-supply regulation of no better than 10% is usually sufficient.

Protective devices should be used to protect not only the plate but also grid No. 2 against overload. In order to prevent excessive plate current flow and resultant overheating of the tube, the common ground lead of the plate circuit should be connected in series with the coil of an instantaneous overload relay. This relay should be adjusted to remove the dc plate voltage and dc grid-No. 2 voltage when the average value of plate current reaches a value slightly higher than normal plate current. A protective device in the grid-No. 2 supply should remove the grid-No. 2 voltage when the dc grid-No. 2 current reaches a value slightly higher than normal.

The rated plate and grid-No. 2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock device should function to break the primary circuit of the high-voltage supplies when any gate or door of the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.
NOTE 1: SEE SKETCH G2 FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8226 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.


NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNUAL REGIONS.
SKETCH GI

OPENING FOR:
RADIATOR 1.575 DIA.

PLATE TERMINAL 1.118 DIA.

GRID-No.2 TERMINAL 1.018 DIA.

GRID-No.1 TERMINAL .763 DIA.

HEATER-CATHODE TERMINAL .518 DIA.

HEATER TERMINAL .239 DIA.

.070 DIA.

ALL DIMENSIONS IN INCHES
PREFERRED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

SEE DETAIL "A"

NOTE: ALL FINGER STOCK (No. 97-380) MFG BY INSTRUMENT SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.

ALL DIMENSIONS IN INCHES

NOTE: ALL FINGER STOCK (No.97-380) MFG BY INSTRUMENT SPECIALTIES COMPANY, LITTLE FALLS, NEW JERSEY.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL COOLING REQUIREMENTS

AIR FLOW DIRECTED THROUGH RADIATOR
INCOMING AIR TEMPERATURE — 24°C

RADIATOR CORE TEMPERATURE — °C (SOLID LINE)
0 0.1 0.2 0.3 0.4 0.5 0.6
PRESSURE DROP — INCHES OF WATER (DASHED LINE)

PLATE DISSIPATION WATTS 300
240
180
120
60

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 6.3
GRID-No. 2 VOLTS = 250
GRID-No. I VOLTS = $E_C$
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 6.3
GRID-No. 2 VOLTS = 350
GRID-No. 1 VOLTS = EC1
TYPICAL CHARACTERISTICS

HEATER VOLTS: 6.3
GRID—No. 2 VOLTS: 250
GRID—No. 1 VOLTS: $E_C$
$I_C_1$: __________
$I_C_2$: __________

E_C = 20

GRID—No.1 OR GRID—No.2 (I_C_2) MA.

PLATE VOLTS

0 500 1000 1500 2000

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
**TYPICAL CHARACTERISTICS**

- **HEATER VOLTS = 6.3**
- **GRID — No.2 VOLTS = 350**
- **GRID — No.1 VOLTS = EC1**
- **IC1**
- **IC2**

---

**Graph Details:**
- **AXIS:**
  - X: PLATE VOLTS
  - Y: GRID - No.1 (IC1) OR GRID - No.2 (IC2) MA.

**Legend:**
- EC1: +30
- +20
- +10
- 10
- 0

---

**Reference:**
- **RADIO CORPORATION OF AMERICA**
- Electron Tube Division
- Harrison, N.J.
- Data Year: 6-63
Typical Constant-Current Characteristics
# TYPICAL CONSTANT-CURRENT CHARACTERISTICS

HEATER VOLTS = 6.3
GRID-No.2 VOLTS = 350

\[ I_{C_1} = \text{GRID-No.1 MA.} \]

\[ I_{C_2} = \text{GRID-No.2 MA.} \]

\[ I_b = \text{PLATE MA.} \]
Traveling-Wave Tube

**HELIX-TRANSMISSION-LINE TYPE**

**FREQUENCY RANGE, 2320-2680 Mc**

**LOW-NOISE AMPLIFIER TYPE**

For Use in Input Stage of Radar, Scatter Propagation, and Other Microwave Receivers, and in IF Amplifiers

**Electrical:**

Heater, for Unipotential Cathode:

- **Voltage (AC or DC):** 5.0 ± 5% volts
- **Current at heater volts = 5.0:** 0.65 amp
- **Starting current:** Must never exceed 4 amperes, even momentarily
- **Minimum cathode heating time:** 1 minute
- **Frequency range:** 2320 to 2680 Mc
- **Minimum cold insertion loss:** 60 db

**Mechanical:**

- **Operating Position:** Any
- **Cooling:** Natural
- **Maximum Overall Length:** 19.50" (500.0 mm)
- **Shell Diameter:** 1.375" ± 0.005" (35 mm ± 0.1 mm)
- **Weight:** 1.5 lbs (0.68 kg)
- **Collector-Terminal Connector:** Special Banana Jack
- **RF Connectors:**
  - **Input terminal:** Type N UG-1813/U Plug
  - **Output terminal:** Type N UG-188/U Plug

**RF Connectors:**

- **Input terminal:** Type N UG-1813/U Plug
- **Output terminal:** Type N UG-188/U Plug

**Pin Numbers and Connectors:**

- **Pin 1 - Grid No. 1**
- **Pin 2 - No Connection**
- **Pin 3 - Helix**
- **Pin 4 - Grid No. 4**
- **Pin 5 - Grid No. 3**
- **Pin 6 - Grid No. 2**
- **Pin 7 - Heater**
- **Pin 8 - Heater, Cathode**

**Maximum and Minimum Ratings, Absolute-Maximum Values:**

- **DC Collector Voltage:** 800 max. volts
- **DC Helix Voltage:** 500 max. volts
- **DC Grid-No. 4 Voltage:** 500 max. volts
- **DC Grid-No. 3 Voltage:** 300 max. volts
- **DC Grid-No. 2 Voltage:** 75 max. volts
- **DC Grid-No. 1 Voltage:** 20 max. volts
- **DC Collector Current:** 500 max. μA
- **DC Helix Current:** 55 max. μA
- **DC Cathode Current:** 500 max. μA
- **Magnetic Field Strength:** 650d min. gauss

---

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices

Harrison, N. J.
RF Power Input:
- Peak: 500 max. watts
- Average: 1.0 max. watts

Metal-Shell Temperature
(At hottest point): 175 max. °C

Typical Operation at 2500 Mc:
- DC Collector Voltage: 600 volts
- DC Helix Voltage: 375 volts
- DC Grid-No.4 Voltage: 325 volts
- DC Grid-No.3 Voltage: 70 volts
- DC Grid-No.2 Voltage (Approx.): 10 volts
- DC Grid-No.1 Voltage: 10 volts
- DC Collector Current: 150 μa
- DC Helix Current: 0.5 μa
- DC Grid-No.4 Current: each less than 1 μa
- DC Grid-No.3 Current: 10 μa
- DC Grid-No.2 Current: 10 μa
- DC Grid-No.1 Current: 10 μa

- Magnetic Field Strength: 850* gauss
- Gain (Low level): 31 db
- Power Output (Saturated): 1.0 mw
- Noise Figure: 4.5 db

Notes:
- Connection to the collector terminal may be made with a banana-type plug similar to a Raytheon Test Jack 27-1594G21 fitted with an insulator from WH Smith Type 211 banana plug.
- Both rf-input and rf-output terminals employ semi-rigid 50-ohm coaxial lines.
- During alignment of the tube in the magnetic focusing field, the helix current may exceed this value for short periods, but should never exceed 10 μa.
- This value of field strength will focus the electron beam, but noise figure will not be optimum.
- Typical peak value for RCA Solenoid, Type HN4901 (See Characteristics of RCA-HN4901 Solenoid).

**CMARACTERISTICS RANGE VALUES**

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td>1</td>
<td>0.45</td>
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<tr>
<td>Input VSMR:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-operating</td>
<td>2,3</td>
<td>-</td>
</tr>
<tr>
<td>Operating</td>
<td>1,4</td>
<td>-</td>
</tr>
<tr>
<td>Output VSMR:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-operating</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Operating</td>
<td>1,4</td>
<td>-</td>
</tr>
<tr>
<td>DC Helix Voltage.</td>
<td>1,4</td>
<td>335</td>
</tr>
<tr>
<td>DC Grid-No.4 Voltage.</td>
<td>1,4</td>
<td>150</td>
</tr>
<tr>
<td>DC Grid-No.3 Voltage.</td>
<td>1,4</td>
<td>25</td>
</tr>
<tr>
<td>Saturated Power Output.</td>
<td>1,4</td>
<td>1,0</td>
</tr>
<tr>
<td>Small-Signal Gain.</td>
<td>1,4</td>
<td>28</td>
</tr>
<tr>
<td>Noise Figure.</td>
<td>1,4</td>
<td>-</td>
</tr>
</tbody>
</table>
Note 1: With heater voltage of 5.0 volts.
Note 2: with no electrode voltages applied.
Note 3: Any tube having a non-operating input VSWR higher than 1.3 but less than 1.5 may be considered acceptable if the operating VSWR is less than 1.5.
Note 4: With electrode voltages and magnetic focusing field adjusted for minimum noise figure at 2500 MC.

OPERATING CONSIDERATIONS

The rated values for collector voltage, helix voltage, grid-No.4 voltage, and grid-No.9 voltage are high enough to be dangerous to the user. Care should be taken during adjustment of circuits, especially when exposed circuit parts are at high dc potential.

The power supply for the 8379 should be capable of holding ripple voltage sufficiently low to prevent phase distortion, and should have adequate regulation to prevent a change in operating conditions which might increase the noise figure. Provision should be made for monitoring helix current, collector current, and cathode current.

The rated heater voltage of 5.0 volts should be applied for at least 1 minute to allow the cathode to reach normal operating temperature before voltages are applied to the other electrodes.

The magnetic field required for focusing the electron beam of the 8379 may be obtained from a solenoid such as the RCA-MW4901 or equivalent. The field must have a distribution as shown in Characteristics of RCA-MW4901 Solenoid. A uniform field provided by a solenoid or permanent magnet of at least 800 gauss starting 2 inches from the groove near the base end of the metal shell and continuing for at least nine inches along the tube axis can provide equivalent focusing.

Initial Alignment Procedure

Apply rated heater voltage to the 8379 for one minute. Then connect operating voltages as shown under Typical Operation to all other tube electrodes except grid No.2. Grid-No.2 voltage may then be applied, and increased until cathode current reaches approximately 50 microamperes.

If the tube is incorrectly aligned within the magnetic field, some of the beam current will be drawn to the helix and increase the helix current. The axial alignment of the 8379 within the magnetic focusing field should then be adjusted to produce a minimum value of helix current. Grid-No.2 voltage should then be increased until collector current is approximately 150 microamperes. Readjust alignment of the tube and magnetic focusing field until a minimum value of helix current is again obtained. Helix current of the 8379 when properly aligned in the magnetic focusing field is usually less than
one microampere. Collector current should be checked to see if it is essentially the same as cathode current. Such a condition is another indication that the tube is properly aligned in the magnetic field. If a solenoid is used to supply the magnetic focusing field, check the solenoid current and readjust it, if necessary, to obtain the specified field-strength value.

The above alignment procedure need not be repeated so long as the adjustments are not disturbed.

Lowest-Noise-Figure Adjustment Procedure

In order to operate the 8379 at the lowest noise figure, it is necessary to adjust the electrode voltages as follows: With the 8379 connected in its circuit, and with either noise input or signal input, adjust the helix voltage to give maximum output at the operating frequency. This value of helix voltage simultaneously produces optimum tube gain and lowest noise figure. Next, with no input signal, vary dc grid-No.1, grid-No.3, and grid-No.4 supply voltages alternately until the receiver output reaches a minimum value. The voltages are now adjusted to operate the 8379 at its lowest noise figure for the particular frequency to which the equipment is tuned. If the strength of the magnetic focusing field changes, it will be necessary to repeat the above adjustment procedure with regard to grid-No.1, grid-No.3, and grid-No.4 voltage.

Preamplifier in Radar Receivers

In the usual type of radar system, a portion of the transmitter pulse leaks through the TR tube to the crystal mixer in the receiver, overloads the crystal, and gradually impairs its performance. If, however, the crystal is preceded by the 8379 in a preamplifier stage, the traveling-wave tube serves as a crystal-protection device because of its saturation characteristic. See accompanying Saturation Characteristics curve. From this curve, it will be noted that the saturated power output of the 8379 is about 1 milliwatt which will not harm the crystal. Therefore, the spike-leakage limit of the TR tube can be eased and thus eliminate the need for supplying "keep-alive" voltage to the TR tube. Furthermore, the ability of the 8379 to withstand an rf peak power input of as much as 500 watts or an average power input of as much as 1 watt makes it possible to employ a TR tube with lower attenuation.

Additional advantages offered by the 8379 in a preamplifier stage include: (1) reduction of the overall noise figure of the radar receiver; (2) improved receiver recovery time; (3) better TR tube life, and (4) reduction of local oscillator radiation. All of these advantages contribute to improved radar-system operation.

Phase-Sensitive Applications

When the 8379 is used in phase-sensitive radar system or in a microwave relay system where frequency-modulated information is amplified, even a small amount of phase distortion
can adversely affect performance. The following table shows for each tube electrode the values of rms ripple voltage which will cause a peak-to-peak change in rf phase of approximately 1 degree.

<table>
<thead>
<tr>
<th>Tube Electrode</th>
<th>Typical Operating DC Volts</th>
<th>Approx. RMS Ripple Volts For Peak-to-Peak Phase Shift of 1°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No. 1</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>Grid No. 2</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>Grid No. 3</td>
<td>70</td>
<td>0.5</td>
</tr>
<tr>
<td>Grid No. 4</td>
<td>325</td>
<td>3.5</td>
</tr>
<tr>
<td>Collector</td>
<td>375</td>
<td>0.024</td>
</tr>
<tr>
<td>Collector</td>
<td>600</td>
<td>6.7</td>
</tr>
</tbody>
</table>

For the RCA Solenoid Type MW4901 operated at 90 volts dc, a peak-to-peak change in rf phase of approximately 1° will be caused by an rms ripple voltage of 7.7 volts.

**Input Matching Considerations**

In general, the voltage standing wave ratio (VSWR) will increase as the electron-beam current of the tube is increased. This "hot VSWR" is a direct function of gain and can be attributed to reflections of the amplified wave at a discontinuity along the slow-wave structure. In contrast, the VSWR with no voltages applied to the tube, is referred to as the "cold VSWR". This "cold VSWR" determines the transfer of input signal energy to the helix and, therefore, the noise figure of the 8379 is not degraded by the "hot VSWR". In general, it will be found that when the input to the 8379 is adjusted for optimum matching under "cold" conditions, the same adjustment will provide optimum matching under "hot" conditions. A typical input matching characteristic is given in the accompanying curve for the 8379 under "cold" conditions.

**Notes On Associated Microwave Circuitry.**

A low-noise traveling-wave tube used in a superheterodyne circuit will cause a 3 db degradation in noise figure unless a filter, is used at the output of the traveling-wave tube to remove noise generated at the image frequency.

Whenever the output of the 8379 is connected to a filter, signals in the reject band of the filter are reflected back into the tube. As these signals travel back through the tube, they suffer little attenuation until they are absorbed by the attenuator. Should there be appreciable reflection from the attenuator or another discontinuity inside the traveling-wave tube, oscillations may occur, depending on the gain within the tube from the attenuator or discontinuity to the output end of the tube.

The 8379 is designed to be short-circuit stable, i.e., the power reflected from a short-circuit output termination will be insufficient to cause oscillation when the 8379 is operating at a normal value of beam current. If the beam current is increased sufficiently above this value, the gain of the tube will increase until oscillation takes place.
When a high-gain microwave amplifier tube such as the travelling-wave tube is employed, special care must be taken to prevent distortion of oscillations resulting from feedback through circuitry external to the tube. Some types of filters may show satisfactory attenuation characteristics in and near the frequency band of interest. However, oscillations can still occur due to "holes" in the filter characteristic at frequencies outside the band of interest. Attenuation of filters should therefore be checked over wide bands and the holes, if any, can be filled by supplementary, simple filters.

**DIMENSIONAL OUTLINE**

**SECTION A-A’**

COLLECTOR TERMINAL (SEE NOTE)

INPUT

1.7 MIN. FOR EITHER CONNECTOR

OUTPUT

1.380 MAX. DIA.

METAL SHELL

**DIMENSIONS IN INCHES**

Note: Special Banana Jack—Mates with Raytheon Test Jack 27-1594G21 fitted with an insulator from an HH Smith Type 211 Banana Plug.
Characteristics of RCA-MW4901 Solenoid

Input-Matching Characteristic

WITH NO VOLTAGES APPLIED TO TUBE

VOLTAGE STANDING WAVE RATIO

FREQUENCY — Mc

0.100 0.150 0.200 0.250 0.300 0.350 0.400 0.450 0.500

2400 2500 2600 2700

0 2 4 6 8 10 12

DISTANCE FROM REFERENCE GROOVE — INCHES

Solenoid Current — 2.5 Amperes

Magnetic Field — Gauss
Saturation Characteristics

$E_f = 5 \text{ VOLTS}$
COLLECTOR VOLTS = 600
HELIX VOLTS = 375
GRID-No. 4 VOLTS = 325
GRID-No. 3 VOLTS = 70
GRID-No. 2 VOLTS ADJUSTED TO GIVE COLLECTOR MICROAMPERES = 150
GRID-No. 1 VOLTS = 10
SIGNAL FREQUENCY (Mc) = 2500
FIELD STRENGTH ALONG HELIX AXIS (GAUSS) = 850
Beam Power Tube

FORCED-AIR COOLED  HIGH GAIN-BANDWIDTH PRODUCTS
INTEGRAL RADIATOR  10000 WATTS CW POWER OUTPUT
THORIATED-TUNGSTEN MESH FILAMENT

For Compact Aircraft, Mobile, and Stationary Equipment Applications in the UHF Frequency Range

Electrical:
Filamentary Cathode, Thoriated-Tungsten Cylindrical-Mesh Type:
Voltage (AC or DC) ... 8.5 typ. volts
Current:
Typical value at 8.5 volts ... 88 amp
Maximum value for starting, even momentarily ... 300 amp
Minimum heating time ... 15 sec
Mu-Factor, Grid No. 2 to Grid No. 1 for plate volts:
= 7000, grid-No. 2 volts
= 1350, and plate ma. = 500
Direct Interelectrode Capacitances:
Grid No. 1 to plate ... 0.4 max. pf
Grid No. 1 to filament ... 86 pf
Plate to filament ... 0.07 max. pf
Grid No. 1 to grid No. 2 ... 88 pf
Grid No. 2 to plate ... 20 pf
Grid No. 2 to filament ... 1.5 max. pf
Mechanical:
Operating Position ... Any
Maximum Overall Length ... 6.186" (See Dimensional Outline)
Maximum Diameter ... 6.170" (See Dimensional Outline)
Weight (Approx.) ... 12 lbs.
Radiator ... Integral part of tube
Terminal Connections (See Dimensional Outline):
G1-Grid-No. 1-
Terminal Contact Surface
G2-Grid-No. 2-
Terminal Contact Surface
F-Filament-
Terminal Contact Surface
K-F-Cathode-
Terminal Contact Surface
P-Plate-
Terminal Contact Surface

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Electronic Components and Devices
Harrison, N. J.
DATA 10-63
Thermal:
Terminal Temperature (Plate, grid No.2, grid No.1, cathode-filament, and filament)........ 250 max. °C
Plate-Core Temperature ........................................ 250 max. °C

Air Flow:
Through radiator — Adequate airflow 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. Typical values of air flow directed through the radiator are shown in accompanying Typical-Cooling-Requirements curve as a function of plate dissipation.

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 to the Cathode-Filament and Filament Terminals 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.

At Sea Level — Cooling requirements as shown in accompanying Typical-Cooling-Requirements curve, may be met by use of the following blowers and associated motors manufactured by Rotron Mfg. Co., Inc., Woodstock, N.Y., or equivalent:
For 100% Plate Dissipation:
Blower Model No. AS-704 KS-704 PS-606
Motor Model No. 255JS 452AS 209JS
Phase (ψ) 3 1 3
Frequency (cps) 60 60 400
Voltage (v) 208 115 115

For 80% Plate Dissipation:
Blower Model No. AS-601 KS-601 PS-4502 PS-4502
Motor Model No. 266JS 413AS 358AS 209JS
Phase (ψ) 3 1 1 3
Frequency (cps) 60 60 400 400
Voltage (v) 208 115 115 115

For 60% Plate Dissipation:
Blower Model No. AS-4506 KS-4506 PS-3503 NS-301
Motor Model No. 139JS 364AS 450AS 587JS
Phase (ψ) 3 1 1 3
Frequency (cps) 60 60 400 400
Voltage (v) 208 115 115 115

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values:
For frequencies up to 500 Kc
DC Plate Voltage. ............... 7000 max. volts
DC Grid-No.2 Voltage. .......... 1500 max. volts
DC Grid-No.1 Voltage: -150 max. volts
DC Plate Current: 4 max. amp
DC Grid-No.1 Current: 1.2 max. amp
Grid-No.1 Input: 150 max. watts
Grid-No.2 Input: 300 max. watts
Plate Dissipation: 10000 max. watts

Typical CCS Operation:

In Cathode-Drive Circuit at 400 Mc
DC Plate Voltage: 6500 volts
DC Grid-No.2 Voltage: 1200 volts
DC Grid-No.1 Voltage: -30 volts
DC Plate Current: 3.5 amp
DC Grid-No.2 Current: 0.05 amp
DC Grid-No.1 Current: 0.53 amp
Driver Power Output (Approx.): 600 watts
Output-Circuit Efficiency: 78 %
Useful Power Output: 10000 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance: 5000 max. ohms
Grid-No.2-Circuit Impedance: 9 ohms
Plate-Circuit Impedance: 4 ohms

\( ^a \) See Characteristics Range Values, Test No.2.
\( ^b \) Continuous Commercial Service.
\( ^c \) Grid input represents the power dissipated in the grid electrode. The grid input is not necessarily the product of the dc grid voltage and the “metered” grid current. For example, see Grid No.2 under Operating Considerations.
\( ^d \) Obtained from a fixed supply.
\( ^e \) Obtained from a grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
\( ^f \) The driver stage is required to supply tube losses and rf circuit losses. It should be designed to provide an excess of power above the indicated values to take care of variations in line voltage, components, initial tube characteristics, and tube characteristics during life.

Characteristics Range Values

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Note Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Filament Current</td>
<td>1</td>
<td>84</td>
<td>92</td>
</tr>
<tr>
<td>2. Direct Interelectrode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td>Grid No.1 to filament</td>
<td>-</td>
<td>78</td>
<td>94</td>
</tr>
<tr>
<td>Plate to filament</td>
<td>2.3</td>
<td>-</td>
<td>0.07</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>-</td>
<td>80</td>
<td>96</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>-</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Grid No.2 to filament</td>
<td>3</td>
<td>-</td>
<td>1.5</td>
</tr>
<tr>
<td>3. Peak Grid-No.1 Voltage</td>
<td>1.4</td>
<td>-</td>
<td>125</td>
</tr>
</tbody>
</table>

Note 1: With 8.5 ac volts on filament.
Note 2: With external flat metal shield 8” in diameter having a center hole 4” 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.
Note 3: With external flat metal shield 8" in diameter having a center hole 3-3/8" 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.

Note 4: With dc plate voltage of 1750 volts, dc grid-No.2 voltage of 1200 volts, and instantaneous grid-No.1 voltage adjusted to give peak plate current of 10 amperes.

OPERATING CONSIDERATIONS

Filament

The rated filament voltage of 8.5 volts should be applied for 15 seconds to allow the cathode to reach normal operating temperature before voltages are applied to other electrodes.

The life of the cathode can then be conserved by adjusting to the lowest nominal filament supply voltage which will give the desired performance. Good regulation of the filament supply voltage about this value is, in general, economically advantageous from the viewpoint of tube life. The supply regulation should not exceed ± 5%. This recommendation is particularly applicable at the higher operating frequencies.

Temperature

The maximum plate core or terminal temperature of 25000°C is a tube rating and is to be observed in the same manner as other ratings. The temperature may be measured with temperature-sensitive paint, such as Tempilaq. This paint is manufactured in the form of liquid or stick by the Tempil Corporation, 132 W. 22nd Street, New York 11, N. Y.

Grid No.2

Grid-No.2 current is composed of a positive-current component resulting from cathode emission to grid No.2 and a negative-current component resulting from secondary-emission phenomena. Because it is the net result of these component currents which is read on a meter in the grid-No.2 circuit, grid-No.2 dissipation can not be accurately determined. Operation similar to conditions given under Typical Operation in tabulated data section will minimize the possibility of exceeding maximum grid-No.2 input rating.

The grid-No.2 circuit must be capable of maintaining the proper grid-No.2 voltage in the presence of moderate negative dc current as well as normal values of positive current. Complete protection can be achieved by the use of a well-regulated power supply, a grid-No.2-to-ground impedance that is low enough to prevent gradual build-up of grid-No.2 voltage and/or catastrophic build-up (runaway) under negative-current conditions, and a current-overload relay to protect the grid No.2 against positive or negative currents of the order of one-tenth the required plate current.

Plate

In beam power tubes with closely spaced electrodes, such as the 8457, extremely high voltage gradients occur even with moderate tube operating voltages. Any arc-over between elec-
trodes may be destructive. A series impedance in the plate lead is recommended. The resultant plate impedance giving a plate-voltage-supply regulation of no better than 10% is usually sufficient.

Standby Operation

During long or frequent standby periods, the 8437 may be operated at decreased filament voltage to conserve life. It is recommended that the filament voltage be reduced to 80% of normal during standby periods up to 2 hours. For longer periods, the filament voltage should be turned off.

Precautions

Protective devices should be used to protect the plate and grid No.2 against overload. Excessive plate-current flow and resultant over-heating of the tube can be prevented by connection of the common ground lead of the plate circuit in series with the coil of an instantaneous overload relay. This relay should be adjusted to remove the dc plate voltage and dc grid-No.2 voltage when the average value of plate current reaches a value slightly higher than normal plate current. A protective device in the grid-No.2 supply should remove the grid-No.2 voltage when the dc grid-No.2 current reaches a value slightly higher than normal.

The rated plate and grid-No.2 voltages of this tube are extremely dangerous. Great care should be taken during the adjustment of circuits. The tube and its associated apparatus, especially all parts which may be at high potential above ground, should be housed in a protective enclosure. The protective housing should be designed with interlocks so that personnel can not possibly come in contact with any high-potential point in the electrical system. The interlock device should function to break the primary circuit of the high-voltage supplies when any gate or door of the protective housing is opened, and should prevent the closing of the primary circuit until the door is again locked.
NOTE 1: SEE SKETCH G1 FOR THE MAXIMUM DIAMETRICAL SPACE REQUIRED BY THE 8437 BASED UPON THE DIAMETER AND ECCENTRICITY OF RADIATOR BAND AND OF EACH RING TERMINAL.


NOTE 3: KEEP ALL STIPPLED REGIONS CLEAR. DO NOT ALLOW CONTACTS OR CIRCUIT COMPONENTS TO PROTRUDE INTO THESE ANNUAL REGIONS.
OPENING FOR:

RADIATOR
6.240 DIA.

PLATE TERMINAL
4.238 DIA.

GRID-No. 2 TERMINAL
3.960 DIA.

GRID-No. 1 TERMINAL
3.335 DIA.

FILAMENT-CATHODE TERMINAL
2.730 DIA.

FILAMENT TERMINAL (INNER)
1.935 DIA.

FILAMENT TERMINAL (OUTER)
2.130 DIA.

Dimensions in inches
PREFERRED MOUNTING ARRANGEMENT & LAYOUT OF ASSOCIATED CONTACTS

NOTE 1: FINGER STOCK No.97-310.
NOTE 2: FINGER STOCK No.97-139.
NOTE 3: SPECIFIED FINGER STOCK IS MADE BY INSTRUMENT SPECIALTIES CO., LITTLE FALLS, N.J.
### TYPICAL COOLING REQUIREMENTS

**INCOMING AIR TEMPERATURE — 24°C**

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION WATTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4000</td>
</tr>
<tr>
<td>B</td>
<td>6000</td>
</tr>
<tr>
<td>C</td>
<td>8000</td>
</tr>
<tr>
<td>D</td>
<td>10000</td>
</tr>
</tbody>
</table>

**DIRECTION OF AIR FLOW**

**AIR FLOW — CUBIC FEET PER MINUTE**

**ANODE CORE TEMPERATURE °C (SOLID LINE)**

**PRESSURE DROP IN INCHES OF WATER (DASHED LINE)**
TYPICAL PLATE CHARACTERISTICS

FILAMENT VOLTS: 8.5
GRID-No.2 VOLTS=1200
GRID-No.1 VOLTS=Ec1

PLATE VOLTS

EC1 = +300
EC1 = +200
EC1 = +100
EC1 = 0

PLATE AMPERES

3000
2000
1000
0

40
30
20
10
0

RADIO CORPORATION OF AMERICA
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TYPICAL CHARACTERISTICS

FILAMENT VOLTS = 8.5
GRID-No.2 VOLTS = 1200
GRID-No.1 VOLTS = E_C1
I_C1 = - - - -
I_C2 = - - - -

GRID-No.1(I_C1) OR GRID-No.2(I_C2) AMPERES

PLATE VOLTS

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DATA 6
10-63
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

FILAMENT VOLTS = 8.5
GRID-No.2 VOLTS = 1200
Ic1 = GRID-No.1 AMPERES
Ic2 = GRID-No.2 AMPERES
Ib = PLATE AMPERES
Beam Power Tube

For Use as an RF Power Amplifier, Oscillator, Regulator, Distributed Amplifier, or Linear RF Power Amplifier in Mobile or Stationary Equipment

Electrical:
- Filamentary Cathode, Woven-Wire-Mesh Type, Oxide-Coated:
  - Voltage (AC or DC) ........................................ 2.9 volts
  - Current at 2.9 volts ........................................ 4.6 amp
  - Minimum heating time .................................... less than 1 sec
- Mu-Factor, Grid No.2 to Grid No.1
  - For plate volts = 250, grid-No.2 volts = 200, and plate amperes = 1.2 ........................................ 11
- Direct Interelectrode Capacitances:
  - Grid No.1 to plate ........................................ 0.13 max. pf
  - Grid No.1 to cathode ...................................... 16 pf
  - Plate to cathode .......................................... 0.03 max. pf
  - Grid No.1 to grid No.2 ................................... 22 pf
  - Grid No.2 to plate ........................................ 7 pf
  - Grid No.2 to cathode ...................................... 3 pf

Mechanical:
- Operating Position ........................................ Any
- Maximum Overall Length .................................. 2.26"
- Seated Length .............................................. 1.920" ± 0.065"
- Diameter ...................................................... 1.426" ± 0.010"
- Weight (Approx.) ........................................... 2 oz
- Socket ........................................................ E. F. Johnson Co. No.124-311-100, Mycalex No.CP464-2, or equivalent
- Grid-No.2 Bypass Capacitor ................................ E. F. Johnson Co. No.124-113-1, or equivalent
- Base .......................................................... Large-Wafer Elevenar 11-Pin with Ring (JEDEC No.E11-61)

Terminal Connections (See Dimensional Outline):
- BOTTOM VIEW

Pin 1 - Filament-Cathode
Pin 2 - Grid No.2
Pin 3 - Grid No.1
Pin 4 - Same as Pin 1
Pin 5 - No Internal Connection
Pin 6 - No Internal Connection
Pin 7 - Grid No.2
Pin 8 - Grid No.1
Pin 9 - Same as Pin 1
Pin 10 - Grid No.2
Pin 11 - Filament
Cap-Plate-Terminal Connection
Cylinder-Plate-Terminal Contact Surface
Ring* - Grid No.2 Terminal Contact Surface
Thermal:
Terminal Temperature  
(All Terminals)........... 250 max. °C
Plate Core Temperature  
(See Dimensional Outline)........... 250 max. °C

Cooling, Conduction:
The plate terminal must be thermally coupled to a constant temperature device (heat sink—solid or liquid) to limit the plate terminal temperature to the specified maximum value of 250° C. The grid-No.2, grid-No.1, and filament terminals may also require coupling to the heat sink to limit their respective terminal temperature to the specified maximum value of 250° C.

LINEAR RF POWER AMPLIFIER

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:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>Up to 500 Mc</td>
</tr>
<tr>
<td>2200 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td></td>
</tr>
<tr>
<td>400 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td></td>
</tr>
<tr>
<td>-100 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td></td>
</tr>
<tr>
<td>450 max. ma</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td></td>
</tr>
<tr>
<td>100 max. ma</td>
<td></td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td></td>
</tr>
<tr>
<td>100 max. watts</td>
<td></td>
</tr>
<tr>
<td>Grid No.2 Input</td>
<td></td>
</tr>
<tr>
<td>8 max. watts</td>
<td></td>
</tr>
</tbody>
</table>

Typical CCS Operation with "Two-Tone Modulation":

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>At 30 Mc</td>
</tr>
<tr>
<td>700 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td></td>
</tr>
<tr>
<td>250 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td></td>
</tr>
<tr>
<td>-20 volts</td>
<td></td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td></td>
</tr>
<tr>
<td>100 ma</td>
<td></td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td></td>
</tr>
<tr>
<td>1420 ohms</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td></td>
</tr>
<tr>
<td>205 ma</td>
<td></td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td></td>
</tr>
<tr>
<td>150 ma</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td></td>
</tr>
<tr>
<td>16 ma</td>
<td></td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td></td>
</tr>
<tr>
<td>10 ma</td>
<td></td>
</tr>
<tr>
<td>Average DC Grid-No.1 Current</td>
<td></td>
</tr>
<tr>
<td>1.0J ma</td>
<td></td>
</tr>
<tr>
<td>Peak-Envelope Driver Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>0.3 watt</td>
<td></td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td></td>
</tr>
<tr>
<td>95 %</td>
<td></td>
</tr>
<tr>
<td>Distortion Products Level:</td>
<td></td>
</tr>
<tr>
<td>Third order</td>
<td>30 db</td>
</tr>
<tr>
<td>Fifth order</td>
<td>35 db</td>
</tr>
<tr>
<td>Useful Power Output (Approx.):</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>40 n watts</td>
</tr>
<tr>
<td>Peak envelope</td>
<td>80 n watts</td>
</tr>
</tbody>
</table>
**Maximum Circuit Values:**

Grid-No.1 Circuit Resistance
- Under Any Condition:
  - With fixed bias: \(25000 \text{ max. ohms}\)
  - With fixed bias (in Class AB\(_1\) operation): \(100000 \text{ max. ohms}\)
  - With cathode bias: Not recommended

Grid-No.2 Circuit Impedance: \(10000 \text{ ohms}\)

Plate Circuit Impedance: \(P\)

---

**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy**

**RF POWER AMPLIFIER — Class C FM Telephony**

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>(2200 \text{ max. volts})</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>(400 \text{ max. volts})</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>(100 \text{ max. volts})</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>(300 \text{ max. ma})</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>(100 \text{ max. ma})</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>8 \text{ max. watts})</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>(100^g \text{ max. watts})</td>
</tr>
</tbody>
</table>

**Typical CCS Operation:**

### In Grid-Drive Circuit at 50 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500 700 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>160 175 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10 -10 \text{ volts})</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 300 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>25 25 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>50 50 \text{ ma})</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)(^g)</td>
<td>1.2 1.2 \text{ watts})</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>85(^n) 110(^n) \text{ watts})</td>
</tr>
</tbody>
</table>

### In Grid-Drive Circuit at 175 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500 700 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 200 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 -30 \text{ volts})</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 300 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>30 20 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>40 40 \text{ ma})</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)(^g)</td>
<td>3 3 \text{ watts})</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>70(^n) 105(^n) \text{ watts})</td>
</tr>
</tbody>
</table>

### In Grid-Drive Circuit at 470 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>700 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 \text{ volts})</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 \text{ volts})</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10 \text{ ma})</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>20 \text{ ma})</td>
</tr>
</tbody>
</table>
In Grid-Drive Circuit at 470 Mc

Driver Power Output (Approx.)... 5 watts
Useful Power Output.............. 85° watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance
Under Any Condition:
With fixed bias ................. 25000 max. ohms
Grid-No.2 Circuit Impedance .... 10000 max. ohms
Plate Circuit Impedance ......... P

a The heating time required for adequate cathode emission is a function of the filament voltage and the impedance of the filament-voltage supply. It may be drastically reduced by employing a suitably designed overvoltage control circuit.
b Measured with special shield adapter.
c E.F. Johnson Co., 1921 10th Ave., Waseka, Minnesota.
d Mycalex Corp. of America, 125 Clifton Blvd., Clifton, N.J.
e For use at higher frequencies.
f 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 300 ma. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 ma.
g Maximum plate dissipation is limited by the maximum plate core temperature and the cooling system to maintain tube operation below the specified maximum plate core temperature. With simple low-cost cooling techniques, maximum plate dissipation may be only about 100 watts; with more sophisticated cooling techniques, maximum plate dissipation may be as high as 300 watts.
h Obtained preferably from a separate well-regulated source.
i This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid-No.1 is driven to zero volts at maximum signal.
j 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.
k Referenced to either of the two tones, and without the use of feedback to enhance linearity.
l This value of useful power is measured at load of output circuit.
m Driver power output includes circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
<th>amp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Filament Current</td>
<td>1</td>
<td>3.6</td>
<td>5.6</td>
</tr>
<tr>
<td>2. Direct Interelectrode Capacitances:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid No.1 to plate</td>
<td>2</td>
<td>-</td>
<td>0.13</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>2</td>
<td>14</td>
<td>18.5</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>2</td>
<td>-</td>
<td>0.03</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>2</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>2</td>
<td>5.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>2</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1.3</td>
<td>-6</td>
<td>-24</td>
</tr>
<tr>
<td>4. Grid-No.2 Current</td>
<td>1.3</td>
<td>-7</td>
<td>+8</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Note 1: With 2.9 volts (AC or DC) on filament.
Note 2: Measured with special shield adapter.
Note 3: With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 ma.

---

Diagram:

- Plate Terminal Cap
- Plate Core Temperature Measurement Point
- Plate Terminal Contact Surface (Cylinder)
- Grid-No.2 Terminal Contact Surface (Ring)
- Ceramic Stippled Region
- Base JEDEC No.E11-81

Dimensions in Inches:

**Note 1:** Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

**Note 2:** The diameters of the plate terminal contact surface, grid-No.2 terminal contact surface, and pin circle to be concentric within the following values of maximum full indicator reading:

- Plate terminal contact surface to grid-No.2 terminal contact surface: ... 0.030" 
- Plate terminal contact surface to pin circle: ... 0.040" 
- Grid-No.2 terminal contact surface to pin circle: ... 0.030"

**Note 3:** The full indicator reading is the maximum deviation in radial position of a surface when the tube is completely rotated about the center of the reference surface. It is a measure of the total effect of run-out and ellipticity.
TYPICAL PLATE CHARACTERISTICS
At a Constant Grid-No. 2 Voltage of 400 Volts

FILAMENT VOLTS = 2.9
GRID-No. 2 VOLTS = 400
GRID-No. 1 VOLTS = ECl
TYPICAL PLATE CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 150 Volts

FILAMENT VOLTS = 2.9
GRID-No.2 VOLTS = 150
GRID-No.1 VOLTS = EI
At a Constant Grid-No.2 Voltage of 400 Volts
TYPICAL CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 250 Volts

FILAMENT VOLTS = 2.9
GRID-No.2 VOLTS = 250
GRID-No.1 VOLTS = ECi
IC1 = — — — —
IC2 = — — — —
TYPICAL CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 150 Volts

FILAMENT VOLTS = 2.9
GRID-No.2 VOLTS = 150
GRID-No.1 VOLTS = EC1
IC1 = ———
IC2 = ——

PLATE VOLTS

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
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TYPICAL CONSTANT-CURRENT CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 400 Volts

FILAMENT VOLTS: 2.9
GRID-No.2 VOLTS: 400
PLATE AMPERES: $I_{B}$
GRID-No.2 AMPERES: $I_{C2}$
GRID-No.1 AMPERES: $I_{C1}$

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
## TYPICAL CONSTANT-CURRENT CHARACTERISTICS
At a Constant Grid-No.2 Voltage of 250 Volts

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament Volts</td>
<td>2.9</td>
</tr>
<tr>
<td>Grid-No.2 Volts</td>
<td>250</td>
</tr>
<tr>
<td>Plate Ampères</td>
<td>IP</td>
</tr>
<tr>
<td>Grid-No.2 Ampères</td>
<td>IC2</td>
</tr>
<tr>
<td>Grid-No.1 Ampères</td>
<td>IC1</td>
</tr>
</tbody>
</table>

![Graph showing typical constant-current characteristics with a constant grid-no.2 voltage of 250 Volts.](image-url)
At a Constant Grid-No.2 Voltage of 150 Volts

FILAMENT VOLTS = 2.9
GRID-No.2 VOLTS = 150
PLATE AMPERES = \( I_b \)
GRID-No.2 AMPERES = \( I_{C2} \)
GRID-No.1 AMPERES = \( I_{C1} \)
Beam Power Tube

CERMOLox® THORIATED-TUNGSTEN MESH FILAMENT INTEGRAL LOUVERED-FIN RADIATOR
FORCED-AIR COOLED

5500 WATTS UHF TV OUTPUT AT 890 Mc
5500 WATTS CW OUTPUT AT 900 Mc

Also Useful in Applications Intended for UHF TV Service in Stationary and Portable Equipment, such as AF Power Amplifiers or Modulators, Plate-Modulated RF Power Amplifiers in Class-C Telephony Service, AM or Single-Sideband Linear RF Power Amplifiers, Hard-Tube Modulators, Pulsed-RF Amplifiers, Regulators, or other Special Services

Electrical:
Filamentary Cathode, Thoriated Tungsten Mesh Type:
Voltage (AC or DC)............... [4.5 typ. volts]
[5.0 max. volts]
Current: At 4.5 volts .............. 125 typ. amp
For starting, even momentarily . . . 300 max. amp
Cold resistance ................. 0.005 ohm
Minimum heating time .......... 15 sec
Mu-Factor, Grid No.2 to Grid No.1
for plate volts = 1200, grid-No.2
volts = 900, and plate amperes = 8 ... 16
Direct Inter-electrode Capacitances:
Grid No.1 to plate ............. 0.32 max. pf
Grid No.1 to filament ......... 65 pf
Plate to filament ............. 0.040 max. pf
Grid No.1 to grid No.2 ....... 70 pf
Grid No.2 to plate .......... 13 pf
Grid No.2 to filament ....... 2.0 max. pf

Mechanical:
Operating Position .............. Vertical, either end up
Maximum Overall Length ........... 5.65"
Maximum Diameter (See Dimensional Outline) ....... 6.17"
Weight (Approx.) ............... 10 lbs
Radiator .................. Integral part of tube
Terminal Connections (See Dimensional Outline):
G1-Grid-No.1- Terminal Contact Surface
G2-Grid-No.2- Terminal Contact Surface
F-Filament- Terminal Contact Surface
K-F-Cathode- Filament Terminal Contact
K-F-Filament Terminal Contact
P-Plate- Terminal Contact
Thermal:

**Terminal Temperature** (Plate, grid No.2, grid No.1, cathode-filament and filament) .................. 250 max. °C

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

**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.

**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.

**RF POWER AMPLIFIER — Class B Television Service**

*Synchronizing-level conditions per tube unless otherwise specified*

**Maximum CCS Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1500 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>4 amp</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>10,000 watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>150 watts</td>
</tr>
<tr>
<td>Grid-No.1 Input</td>
<td>100 watts</td>
</tr>
</tbody>
</table>

**Typical CCS Operation:**

In a cathode-drive circuit at 890 Mc and bandwidth of 8.5 Mc

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>5700 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-40 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>2.9 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>2.2 amp</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.015 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.011 amp</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>0.375 amp</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>0.275 amp</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>600 watts</td>
</tr>
<tr>
<td>Pedestal level</td>
<td>335 watts</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>80 %</td>
</tr>
</tbody>
</table>
Useful Power Output:
Synchronizing level ........................ 5500 watts
Pedestal level .................................. 3100 watts

RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy
and
RF POWER AMPLIFIER — Class C FM Telephony

Maximum CCS Ratings, Absolute-Maximum Values:
DC Plate Voltage .......................... 7000 volts
DC Grid-No.2 Voltage .................. 1500 volts
DC Grid-No.1 Voltage ................. -100 volts
DC Plate Current ......................... 3 amp
DC Grid-No.1 Current .............. 0.65 amp
Grid-No.1 Input ........................... 100 watts
Grid-No.2 Input ........................... 150 watts
Plate Dissipation ......................... 10 000 watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance .............. 5000 ohms
Grid-No.2-Circuit Impedance ................ See Note g
Plate-Circuit Impedance ..................... See Note h

Typical CCS Operation:
In Cathode-Drive Circuit at 900 Volts

DC Plate Voltage .......................... 5700 volts
DC Grid-No.2 Voltage .................. 1000 volts
DC Grid-No.1 Voltage ................. -85 volts
DC Plate Current ......................... 2.7 amp
DC Grid-No.2 Current .............. 0.025 amp
DC Grid-No.1 Current .............. 0.200 amp
Driver Power Output ......................... 900 watts
Output-Circuit Efficiency ................. 72 %
Useful Power Output ......................... 5500 watts

a With external flat metal shield 8" in diameter having a center hole 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.
b With external flat metal shield 8" in diameter having a center hole 2-3/8" 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.

c See Electrical Considerations — Filament or Heater.
d See Cooling Considerations — Forced-Air Cooling.
e See Classes of Service.
f See Electrical Considerations — Grid-No.1 voltage Supply.
g See Electrical Considerations — Grid-No.2 voltage Supply.
h See Electrical Considerations — Plate voltage Supply.

The following footnotes apply to the RCA transmitting tube Operating Considerations given at front of this section.
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 - 6.240
   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 (ID) - 0.908
   g. Filament Terminal (OD) - 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 filament, 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.
Note: All finger stock No. 97-380, made by Instrument Specialties Co., Little Falls, N.J.

CAVITY TUNING CHARACTERISTICS

GRID No. 1 TO GRID No. 2

DATA 3 4-65
CAVITY TUNING CHARACTERISTICS

CAVITY LENGTH L — INCHES

GRID No.1 TO CATHODE

1/4 MODE

3/4 MODE

FREQUENCY — Mc

GRID No.2 TO PLATE

1/4 MODE

3/4 MODE

FREQUENCY — Mc

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
### TYPICAL COOLING CHARACTERISTICS

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION (Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4000</td>
</tr>
<tr>
<td>B</td>
<td>6000</td>
</tr>
<tr>
<td>C</td>
<td>8000</td>
</tr>
<tr>
<td>D</td>
<td>10000</td>
</tr>
</tbody>
</table>

**Incoming Air Temperature — 25°C**

- **Plate Dissipation Curve**: Watts
- **Direction of Air Flow**
- **Air Flow — Cubic Feet Per Minute**
- **Plate Core Temperature °C (Solid Line)**
- **Pressure Drop in Inches of Water (Dashed Line)**

---

**Radio Corporation of America**

Electronic Components and Devices

Harrison, N. J.

*DATA 4
4-65*
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

FILAMENT VOLTS = 4.5
GRID-No. 2 VOLTS = 1000
PLATE AMPERES = $I_b$
GRID-No. 2 AMPERES = $I_{C2}$
GRID-No. 1 AMPERES = $I_{C1}$

DATA 4
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Super-Power Klystron

FIVE-RESONATOR, FIXED-TUNED, MAGNETICALLY-FOCUSED WATER-COOLED TYPE
21-MEGAWATT PEAK PULSE OUTPUT AT 2856 Mc/s
For RF-Pulsed Amplifier in S-Band Linear Accelerator Service

ELECTRICAL

Heater, for Matrix-Type Oxide-Coated Unipotential Cathode
Voltage (AC or DC) ........................................ 15 V
See accompanying Electrical Considerations
Current:
Typical value at 15 volts .................................... 14 A
Starting value, even momentarily. ......................... 30 max A
Cold resistance ........................................... 0.15 Ω
Heating time (Minimum) ................................... 20 min
At normal operating current before applying beam voltage

Pump ................................................................. Sputter Ion Type
See accompanying Electrical Considerations

Direct Interelectrode Capacitances
Anode to cathode ............................................ 42 pF
Anode to cathode ............................................ 50 pF
With corona shield and in permanent magnet

Frequency (Center) ............................................ 2856 Mc/s
Phase Sensitivity to Beam Voltage ........ 6 deg/per cent of beam-voltage change

MECHANICAL

Operating Position ........................................... Vertical, cathode end down
Maximum Overall Length .................................... 49.7 in
Maximum Diameter ........................................... See accompanying Dimensional Outline

Cooling Connections
Inlet ............................................................. 1/2 in — 14MPT
Outlet ............................................................. 1/2 in — 14MPT

Circuit Connections
Beam and heater voltage terminals ...................... See accompanying Dimensional Outline
RF input ......................................................... Mates with UG-573/U male
RF output ....................................................... Mates to Waveguide WR284 with
Sputter ion pump voltage ................................... Mates with No.924-0715A

Weight (Approx.)
Without magnets ............................................. 150 lb
With electromagnet and lead X-radiation shields attached ........................................ 1100 lb
With permanent magnet and lead X-radiation shields attached ................................... 1625 lb
**THERMAL**

**Metal Surface Temperature**
- At O-ring groove on cathode cylinder: 100 max °C
- All other metal surfaces: 150 max °C
- Ambient Oil Temperature: 100 max °C
- Electron-gun-assembly bath

**Window Band Temperature**
- Through 10-32 NF tapped hole in window cover to accommodate thermocouple: 90 max °C

**Temperature-Measurement Points**
- See accompanying Dimensional Outline

**Oil Immersion**
- Oil immersion of the electron gun assembly is required.
- The tube must be lowered into an oil bath to the level shown on the Dimensional Outline. The oil bath must be of sufficient volume to limit the surface of the electron gun assembly to a temperature below 100° C. Transformer oil with high insulating properties, such as GE10C or equivalent, must be used.

**Water Cooling**
- Water cooling of the internal structure is required.
- The water flow must start before application of any voltage in order to purge the system of bubbles and should continue for several minutes after removal of voltage. Interlocking of the water flow with the power supply is recommended to prevent tube damage in case of failure of adequate water flow.

**Water Flow**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>of 78 kw</td>
<td>gpm</td>
<td>gpm</td>
<td>psig</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

**Resistivity of water at 25° C**
- 1 min MΩ-cm

**Water temperature at outlet**
- 70 max °C

**Max. water pressure at inlet**
- 100 max psi

---

**PULSED RF AMPLIFIER**

**Absolute-Maximum Ratings**
- For a maximum dc pulse "ON" time of 3.2 microseconds in any 2700-microsecond interval, and rf load vacuum pressure of 10^-7 Torr.

**Peak Beam Voltage**
- 260 kV

**Peak Inverse Beam Voltage**
- 50 kV

**Peak Beam Current**
- 270 A

**Peak Input Beam Power**
- 68 MW

**Average Input Beam Power**
- 78 kW
### Typical Operation

With rectangular waveshape pulses, rf pulse duty factor of 0.0009, rf pulse duration of 2.5 μs centered within a dc pulse duration of 3.2 μs, and at a frequency of 2856 Mc/s.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Beam Voltage</td>
<td>250</td>
</tr>
<tr>
<td>Peak Beam Current</td>
<td>250</td>
</tr>
<tr>
<td>Driving Power Output</td>
<td>106 150</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>21° 12°</td>
</tr>
<tr>
<td>Power Gain</td>
<td>53 49</td>
</tr>
<tr>
<td>Phase Modulation</td>
<td>0.14 0.1</td>
</tr>
<tr>
<td>Amplitude Modulation</td>
<td>0.12 0.05</td>
</tr>
</tbody>
</table>

**Maximum Circuit Value**

Load VSWR: 1.5:1

---

### Characteristics Range Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Peak Beam Current</td>
<td>1.2</td>
<td>237</td>
</tr>
</tbody>
</table>

**Note 1:** With 15 volts ac or dc on heater.

**Note 2:** With beam voltage of 250 kilovolts.

---

### Accessories

For RCA-8568 SUPER-POWER KLYSTRON

The following tabulated accessories are shown in position on the accompanying Assembly Drawing:

<table>
<thead>
<tr>
<th>RCA Type No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJ2106</td>
<td>Set of X-radiation Shields (Includes AJ2107 through AJ2113)</td>
</tr>
<tr>
<td>AJ2107</td>
<td>Upper Collector X-radiation Shield</td>
</tr>
<tr>
<td>AJ2108</td>
<td>Lower Collector X-radiation Shield</td>
</tr>
<tr>
<td>AJ2109</td>
<td>Outlet Water Pipe X-radiation Shield</td>
</tr>
<tr>
<td>Type No.</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>AJ2110</td>
<td>Window X-radiation Shield</td>
</tr>
<tr>
<td>AJ2111</td>
<td>Waveguide X-radiation Shield</td>
</tr>
<tr>
<td>AJ2112</td>
<td>Inlet Water Pipe X-radiation Shield</td>
</tr>
<tr>
<td>AJ2113</td>
<td>Aluminium &quot;Spool&quot; Casting X-radiation Shield</td>
</tr>
<tr>
<td>AJ2114</td>
<td>Permanent Magnet</td>
</tr>
<tr>
<td>AJ2115</td>
<td>Corona Shield</td>
</tr>
<tr>
<td>AJ2116</td>
<td>Sputter-Ion-Pump Magnet and Bracket Assembly</td>
</tr>
<tr>
<td>AJ2117</td>
<td>Electromagnet</td>
</tr>
<tr>
<td>AJ2119</td>
<td>Aluminum Waveguide-Flange Gasket</td>
</tr>
<tr>
<td>AJ2120</td>
<td>Copper Waveguide-Flange Gasket</td>
</tr>
<tr>
<td>AJ2121</td>
<td>Male Waveguide Flange</td>
</tr>
<tr>
<td>AJ2122</td>
<td>O-ring, uniform dash number 441 Buna N</td>
</tr>
<tr>
<td>AJ2123</td>
<td>Waveguide-Flange Hardware (Includes 10 sets of 3/8-16 x 2-1/4 hex head bolts, 3/8-16 nuts, and 0.625 OD x 0.390 ID x 1/16 washers)</td>
</tr>
</tbody>
</table>

**OPERATING CONSIDERATIONS**

**ELECTRICAL**

**X-Radiation Warning**

Because the 8568 is designed to be operated at peak voltages as high as 260 kilovolts, shielding of the tube for X-radiation is necessary to protect against possible injury to operating personnel.

A set of X-radiation shields to reduce X-radiation to a level not to exceed 3 milliroentgens/hour at a distance of 36 inches from the major tube axis is available as an accessory, RCA-AJ2106. The shields are available individually or in a set.

**Heater Voltage**

The life of the cathode can be conserved by adjusting to the lowest heater supply voltage that will give the desired performance. In a klystron, however, the heater voltage must not be reduced to a level that will cause an excessive reduction in beam current; otherwise, the cathode may be damaged.

A recommended procedure for adjusting heater voltage during life for maximum life expectancy is as follows:

1. Set the heater voltage at the recommended value.
2. Set the beam voltage at the maximum operating voltage during adjustment.
3. Reduce the heater voltage in 0.5-volt steps with 20-minute stabilization periods between each step.
4. Monitor the beam current continually.
**CAUTION**

With the beam voltage held constant, the beam current must never drop more than three amperes. If the three-ampere drop is exceeded, TURN OFF BEAM VOLTAGE IMMEDIATELY.

5. Lower the heater voltage until the beam current is reduced two amperes.

6. Increase heater voltage approximately ten percent of the minimum value of heater voltage noted in step 5 above. If the heater voltage supply is regulated, increase heater voltage approximately five percent of the minimum value of heater voltage noted in step 5 above.

**Sputter Ion Pump**

The sputter ion pump on the 8568 is a variant of the RCA-VC2119; the only difference is in the vacuum system connection.

The RCA-V22OL Control Unit is a power supply designed especially for the VC2119 Series sputter ion pumps.

**PM Magnetic Field**

For applications using permanent-magnet-focused 8568's, care must be taken that the magnetic field is not distorted by effects of other ferromagnetic materials. In general, such materials should be located at least three feet from the magnet.

**MECHANICAL**

**Handling**

Raise the tube and magnet by using a hoist attached to three eyebolts on the top flange of the magnet, or by three eyebolts which can be screwed into the 1/2"-13 tapped holes located on the top flange of the aluminum "spool" casting. See Dimensional Outline for eyebolt locations.

**CAUTION**

Do not rest the tube on the corona shield or heater contact.

Rest the tube in an appropriate stand on the lower side of the bottom flange of the aluminum "spool" casting. The tube can also rest on the three locating "buttons" when so equipped.

**Mounting**

For equipment design, the tube is mounted by resting the lower side of the bottom flange of the aluminum "spool" casting on the focusing magnet.

**Connections**

The output waveguide of the 8568 contains an rf window to close the vacuum envelope of the tube.

---

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices

Harrison, N. J.

DATA 3

10-65
CAUTION

External pressure (load side) applied to the rf window must not exceed $10^{-7}$ Torr during operation, otherwise the tube may be damaged.

In certain cases, it may be desirable to pressurize rather than evacuate the load side of the window to prevent damage to the tube.

The window must be kept clean of any foreign material. When the load waveguide is not connected to the tube, the plastic cover supplied for shipping should be used to cover the tube waveguide flange.

A male waveguide flange, RCA-AJ2121, a non-reusable gasket, RCA-AJ2119 (aluminum) or RCA-AJ2120 (copper), and ten sets of nuts, bolts, and washers, RCA-AJ2123, can be used to provide a vacuum-tight waveguide seal. The nuts should be evenly tightened, with a torque wrench in increments of $1/8$ to $1/4$ turn each cycle. The final torque must not exceed 100 pound-inches. The copper gasket should be selected if the oxidation rate of the aluminum is excessive. Power supply voltage connections to the tube are made with a corona shield, RCA-AJ2115.

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

Commercial Engineering
Electronic Components and Devices
Radio Corporation of America
Harrison, New Jersey
DIMENSIONAL OUTLINE
Side View

WATER OUTLET, NOTE 2

RF OUTPUT
SPUTTER-ION PUMP

WINDOW COVER

ALUMINUM "SPOOL" CASTING

10.15 ± 0.05

15.00 ± 0.03

4.7 MAX.

WATER INLET NOTE 2

MOUNTING SURFACE

OUTPUT CAVITY X-RAY SHIELD

LOWER OUTPUT CAVITY X-RAY SHIELD

30.20 ± 0.20

TEMPERATURE MEASUREMENT POINT FOR O-RING GROOVE

O-RING

7.484 DIA., NOTE 1

OIL LEVEL

9.98 ± 0.00

DETAIL A

DIMENSIONS IN INCHES

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.

DATA 4
10-65
Note 1: Recommended diameter of O-ring sealing surface.

Note 2: 1/2-14 external American Standard taper pipe thread (Male).

Note 3: Six (6) mounting holes, 9/16 inch diameter through the 13.00-inch diameter flange. Equally spaced on a bolt circle of 11.56 inch diameter.

Note 4: Three (3) holes, 1/2-13 NC, equally spaced on a bolt circle of 10.00 inches for lifting eyebolts.
Super-Power Beam Power Tube

2 MEGAWATTS PEAK POWER OUTPUT IN SHORT-PULSE SERVICE AT 425 MHz

PULSE LENGTH TO 15 MICROSECONDS

LOW FILAMENT POWER FOR AIRBORNE USE

LIQUID COOLED

For Grid-Driven, Plate-Pulsed Amplifier Applications at Frequencies from 174 to 600 MHz in Long-Range Search Radar and in Pulsed Communications Applications

The 8587 is the same as the 6952 except for the following items:

MECHANICAL

Overall Length. . . . . . . . . . . . . . . . . . . . . 9.19 ± 0.31 in

COOLING CONSIDERATIONS

To inspect the plate coolant course: (1) Remove the 8 screws from the plate terminal. Lift the plate-terminal assembly carefully out of the tube. This assembly should come out easily. (2) Remove the 0-ring from the moat. (3) Inspect the internal structure of the plate coolant course with the aid of a convenient light source.

(a) When water or ethylene-glycol-water solution is used, the plate-terminal assembly may stick in (1) above due to excessive deposit build-up. If so, clean the plate coolant course before further attempting to remove the assembly. In (3) above determine if there is a flaky or adherent deposit on the structure. If a deposit is observed, it should be removed. Such a deposit generally consists of copper oxide (usually black) which can be removed by cleaning as above.

(b) When liquid coolant FC75 is used, determine if there are any particles. Remove any particles. In general, the metal surface of the coolant course should not exhibit any heavy deposits or oxide coatings.

(4) Replace the 0-ring in the moat. Orient the plate-terminal assembly so that it is in its original position (refer to the index pin of the tube for orientation) and then seat it. Replace the 8 screws. Tighten the screws in succession until snug.

* See Cooling Considerations-Liquid Cooling, under RCA Transmitting Tube Operating Considerations given at front of this section.
A detailed Dimensional Outline and associated Gauge Drawings are given in the Technical Bulletin available upon request.

FOR ADDITIONAL INFORMATION ON THIS TYPE INCLUDING INPUT AND OUTPUT CAVITY DRAWINGS, WRITE FOR TECHNICAL BULLETIN AND APPLICATION GUIDE FOR RCA SUPER POWER TUBES, ICE-279A, AVAILABLE FROM:

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

CERMOLOX® RUGGEDIZED TYPE INTEGRAL RADIATOR
FORCED-AIR COOLED 40 WATTS CW POWER OUTPUT AT 1215 Mc/s
MATRIX-TYPE, OXIDE-COATED, UNIPOTENTIAL CATHODE

For Use in Compact Aircraft, Mobile, and Stationary Equipment

The 8596 is the same as the 7457 except for the following items:

MECHANICAL
Maximum Overall Length .................. 2.036 in
Maximum Diameter ...................... 1.327 in

THERMAL
Plate, Grid No.2, Grid No.1, Cathode, and
Heater Temperature .................... 250 max °C
Plate-Core Temperature ................. 250 max °C

CHARACTERISTICS RANGE VALUES

Zero Bias Plate Current ............... 1,7790 - 390 mA

NOTE 7: With dc plate volts = 300, dc grid-No.2 volts = 150, dc grid No.1 volts = 0.

DIMENSIONAL OUTLINE

DIMENSIONS IN INCHES

For notes, see next page.

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Electronic Components and Devices
Harrison, N. J.
NOTE 1: The following diametrical space requirements accommodate the concentricity of the cylindrical surfaces of the radiator band, axial pin, and each electrode terminal:

a. Radiator Band - 1.376 inch  
   e. Heater-Cathode Terminal - 0.519 inch  
   b. Plate Terminal - 1.119 inch  
   f. Heater Terminal - 0.238 inch  
   c. Grid-No. 2 Terminal - 1.019 inch  
   g. Axial Pin - 0.071 inch  
   d. Grid-No. 1 Terminal - 0.764 inch

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

**PREFERRED MOUNTING ARRANGEMENT**

**and Layout of Associated Contacts**

NOTE 1: If a clamp is used, it must be adjustable in a plane normal to the major tube axis to compensate for variations in concentricity between the radiator cylinder and the contact terminals.

NOTE 2: Contact ring No. 97-252 or finger stock No. 97-380.

NOTE 3: Contact ring No. 97-253 or finger stock No. 97-380.

NOTE 4: Contact ring No. 97-254 or finger stock No. 97-380.

NOTE 5: Contact ring No. 97-255 or finger stock No. 97-380.

NOTE 6: 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., Little Falls, N. J.
**Power Triode**

**NUVISTOR TYPE**

**ENVIRONMENTAL TESTS**

*For Cathode-Drive, Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Applications to 1.2 Gc/s in Aircraft, Industrial, Military, and Other Equipment Operating Under Conditions of Severe Shock and Vibration.*

**LIFE TEST**

**ELECTRICAL CHARACTERISTICS**

**Bogey Values**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (AC or DC)</td>
<td>$E_f$ 6.3 V</td>
</tr>
<tr>
<td>Heater Current at $E_f = 6.3$ V</td>
<td>$I_f$ 150 mA</td>
</tr>
<tr>
<td>Heater Input.</td>
<td>$P_f$ 0.95 W</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances Without external shield</td>
<td></td>
</tr>
<tr>
<td>Input: K to (G,S,H)</td>
<td>$C_{i}$ 6.0 pF</td>
</tr>
<tr>
<td>Output: P to (G,S,H)</td>
<td>$C_{o}$ 1.2 pF</td>
</tr>
<tr>
<td>Heater to cathode</td>
<td>$C_{hk}$ 1.4 pF</td>
</tr>
</tbody>
</table>

**Class A1 Amplifier**

*For following characteristics, see Conditions*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplification Factor</td>
<td>$\mu$ 60 70</td>
</tr>
<tr>
<td>Plate Resistance (Approx.)</td>
<td>$r_p$ 6300 5400 $\Omega$</td>
</tr>
<tr>
<td>Transconductance</td>
<td>$g_m$ 9500 13000 $\mu$mho</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>$I_b$ 9 11.5 mA</td>
</tr>
<tr>
<td>Cutoff DC Grid Voltage for $I_b = 10$ $\mu$A</td>
<td>$E_c(co)$ -6 V</td>
</tr>
</tbody>
</table>

**Conditions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>$E_f$ 6.3 6.3 V</td>
</tr>
<tr>
<td>Plate Supply Voltage</td>
<td>$E_{bb}$ 150 110 V</td>
</tr>
<tr>
<td>Grid Supply Voltage</td>
<td>$E_{cc}$ 0 0 V</td>
</tr>
<tr>
<td>Cathode Resistor</td>
<td>$R_k$ 150 47 $\Omega$</td>
</tr>
</tbody>
</table>

**MECHANICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Position</td>
<td>Any</td>
</tr>
<tr>
<td>Type of Cathode</td>
<td>Coated Unipotential</td>
</tr>
<tr>
<td>Minimum Overall Length ($l_m$)</td>
<td>0.985 in</td>
</tr>
<tr>
<td>Maximum Seated Length ($l_{sm}$)</td>
<td>0.780 in</td>
</tr>
<tr>
<td>Maximum Diameter ($d_m$)</td>
<td>0.440 in</td>
</tr>
<tr>
<td>Weight (Approx.)</td>
<td>2.2 g</td>
</tr>
<tr>
<td>Dimensional Outline</td>
<td>JEDEC No.4-6</td>
</tr>
<tr>
<td>Envelope</td>
<td>JEDEC MT4</td>
</tr>
<tr>
<td>Top Capa</td>
<td>Small (JEDEC C1-44)</td>
</tr>
<tr>
<td>Baseb</td>
<td>Medium-Ceramic-Wafer Twelvar 5-Pin (JEDEC E5-79)</td>
</tr>
</tbody>
</table>

---

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Electronic Components and Devices  Harrison, N. J.
Basing Designation for BOTTOM VIEW

---

*INDEX = LARGE LUG  * - SHORT PIN - IC*

---

**ABSOLUTE MAXIMUM RATINGS**

For Low-Level Class-C RF-Power-Amplifier, Oscillator, or Frequency-Multiplier Tube Operation at frequencies up to 1.2 Gc/s

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plate Supply Voltage</strong></td>
<td>$E_{bb}$</td>
</tr>
<tr>
<td><strong>DC Plate Voltage</strong></td>
<td>$E_{b}$</td>
</tr>
<tr>
<td><strong>Grid Voltage</strong></td>
<td></td>
</tr>
<tr>
<td>Peak positive value</td>
<td>$e_{cm}$</td>
</tr>
<tr>
<td>DC positive value</td>
<td>$E_{c}$</td>
</tr>
<tr>
<td>DC negative value</td>
<td>$E_{c}$</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage</td>
<td>$e_{hk}$</td>
</tr>
<tr>
<td>Heater Voltage, AC or DC</td>
<td>$E_{f}$</td>
</tr>
<tr>
<td><strong>Instantaneous Voltage</strong></td>
<td></td>
</tr>
<tr>
<td>Between top cap or base pins and metal shell</td>
<td></td>
</tr>
<tr>
<td><strong>Average Grid Current</strong></td>
<td>$I_{c(av)}$</td>
</tr>
<tr>
<td><strong>Average Cathode Current</strong></td>
<td>$I_{k(av)}$</td>
</tr>
<tr>
<td><strong>Plate Dissipation</strong></td>
<td>$P_{b}$</td>
</tr>
<tr>
<td><strong>Envelope Temperature</strong></td>
<td>$T_{e}$</td>
</tr>
</tbody>
</table>

**MAXIMUM CIRCUIT VALUES**

<table>
<thead>
<tr>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grid-Circuit Resistance</strong></td>
<td>$R_{g(ckt)}$</td>
</tr>
<tr>
<td>For fixed-bias or cathode-bias operation:</td>
<td></td>
</tr>
<tr>
<td>For $T_{e} \leq 150^\circ$ C</td>
<td></td>
</tr>
<tr>
<td>For $T_{e} &gt; 150^\circ$ C</td>
<td></td>
</tr>
</tbody>
</table>

---

DATA 1

RADIO CORPORATION OF AMERICA

Electronic Components and Devices  Harrison, N. J.
**TYPICAL OPERATION — CCS**

**As Cathode-Drive RF Power Amplifier**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Heater Voltage</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>5.5</td>
<td>5.5</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Average Plate Current</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Average Grid Current</td>
<td>4.5</td>
<td>4</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>1.4</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**As RF Oscillator**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Heater Voltage</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-5.5</td>
<td>-5.5</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Average Plate Current</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Average Grid Current</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>1.25</td>
<td>1.25</td>
</tr>
</tbody>
</table>

**As Cathode-Drive Frequency Doubler**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Frequency</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Heater Voltage</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Average Plate Current</td>
<td>18.5</td>
<td>18.5</td>
</tr>
<tr>
<td>Average Grid Current</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.7</td>
<td>0.7</td>
</tr>
</tbody>
</table>

a Designed to mate with "1/4-inch" connector generally available from your local RCA Distributor.
b Designed to mate with Cinch Mfg. Co. socket No. 133 65 10 041, Cinch-Jones Sales-Division Distributor socket Designation SNS-3, or equivalent.
c Pin 7 is of a length such that its end does not touch the socket insertion plane.
d Continuous Commercial Service.
e Intermittent Commercial and Amateur Service. No operating or CN period exceeds 5 minutes and every CN period is followed by an OFF or standby period of the same or greater duration.
f Measured on metal shell in Zone "A" (See Dimensional Outline).
g Measured at load.

**INITIAL CHARACTERISTICS LIMITS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current.</td>
<td>1</td>
<td>140</td>
<td>160</td>
</tr>
<tr>
<td>Direct Interelectrode Capacitances</td>
<td>2</td>
<td>-</td>
<td>0.046</td>
</tr>
<tr>
<td>Cathode to plate.</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
</tr>
<tr>
<td>Input: K to (G,S,H).</td>
<td>-</td>
<td>0.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Output: P to (G,S,H).</td>
<td>-</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Heater to cathode.</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Amplification Factor.</td>
<td>3</td>
<td>50</td>
<td>90</td>
</tr>
</tbody>
</table>

RADIO CORPORATION OF AMERICA  
Electronic Components and Devices  
Harrison, N. J.  
DATA 2  
10-65
### Transconductance

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>7500</td>
<td>11500</td>
</tr>
<tr>
<td>(2)</td>
<td>10500</td>
<td>15500</td>
</tr>
</tbody>
</table>

### Plate Current

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>6.5</td>
<td>11.5</td>
</tr>
<tr>
<td>(2)</td>
<td>8.5</td>
<td>14.5</td>
</tr>
</tbody>
</table>

### Cutoff Plate Current

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>-</td>
<td>50</td>
</tr>
<tr>
<td>(2)</td>
<td>1.1</td>
<td>-</td>
</tr>
</tbody>
</table>

### Total Grid Current

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>-</td>
<td>-0.1</td>
</tr>
</tbody>
</table>

### Leakage Resistance

<table>
<thead>
<tr>
<th>Note</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>(2)</td>
<td>10</td>
<td>-</td>
</tr>
</tbody>
</table>

### Notes

1. With $E_f = 6.3$ V.
3. With $E_f = 6.3$ V, $E_{bb} = 110$ V, $E_{cc} = 0$ V, $R_k = 47$ Ω, $C_k = 1000$ μf.
4. With $E_f = 6.3$ V, $E_{bb} = 150$ V, $E_{cc} = 0$ V, $R_k = 150$ Ω, $C_k = 1000$ μf.
5. With $E_f = 6.3$ V, $E_b = 150$ V, $E_{cc} = -7$ V.
6. Measured at load in cathode-drive rf-power-amplifier circuit with $f = 1$ Ge/s, $E_f = 6.3$ V, $E_{bg} = 175$ V, $E_{kg} = 6$ V from $R_g = 1200$ Ω, $I_{b(ave)} = 23$ mA max, $I_{c(ave)} = 5$ mA max, $P_g = 150$ mW, circuit tuned for maximum $P_{output}$.
7. With $E_f = 6.3$ V, $E_b = 150$ V, $E_{cc} = -1.3$ V, $R_g = 0$ Ω.
8. With $E_f = 6.3$ V, $E_{hk} = ±100$ V.
9. With $E_f = 6.3$ V, $E_{g-all} = -100$ V.
10. With $E_f = 6.3$ V, $E_{p-all} = -300$ V.
11. Tubes are criticized for Shorts, Discontinuities, and Air Leaks.

### ENVIRONMENTAL TESTS

#### Peak Impact Acceleration

1000 g

#### Duration of approximate half-sine-wave mechanical-shock pulse

0.8 ± 0.2 ms

#### Operating Conditions during Test

$E_f = 6.3$ V, $E_{bb} = 150$ V, $E_{cc} = -1.3$ V, $R_g = 50$ kΩ, $E_{hk} = 100$ V

#### Post-Shock Limits and Rejection Criteria

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta I_{g,m}$</td>
<td>±15 %</td>
</tr>
<tr>
<td>$I_{c}$</td>
<td>-0.1 μA</td>
</tr>
<tr>
<td>$I_{hk}$</td>
<td>±10 μA</td>
</tr>
</tbody>
</table>

#### ERpm (Variable-Frequency-Vibration Test Limits)

<table>
<thead>
<tr>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 6 kc/s</td>
<td>100 mV</td>
</tr>
<tr>
<td>6 to 15 kc/s</td>
<td>1000 mV</td>
</tr>
</tbody>
</table>

Tap and Permanent Shorts, and Discontinuities.
Low-Impact, Long-Duration Shock

Peak Impact Acceleration ............... 50 g
Duration of approximate half-sine-wave mechanical-shock pulse ............... 11 ± 2 ms
Condition during Test
No tube-element voltages are applied.
Post-Shock Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Sweep-Frequency-Vibration Fatigue

Vibration-Frequency Range (Overall) .... 5 to 500 to 5 c/s
Peak Displacement (5 to 50 and 50 to 5 c/s) .... 0.040 in
Peak-to-peak value ............... 0.080 in
Peak Vibrational Acceleration
(50 to 500 to 50 c/s) ............... 10 g
Period of 1 sweep cycle (Approx.)
(5 to 500 to 5 c/s) ............... 15 m
Duration of Test (Overall) ............... 9 h
Along each of 3 mutually perpendicular axes ............... 3 h
Operating Condition during Test
EF = 6.3 V
Post-Sweep-Frequency-Vibration-Fatigue Limits and Rejection Criteria
Same as those specified above for the High-Impact, Short-Duration Shock Test

Variable-Frequency Vibration

Vibration-Frequency Range (Overall) .... 3 to 15 kc/s
Peak Vibrational Acceleration in Xj position ............... 1 g
Period of 1 sweep cycle (3 to 15 kc/s) ............... 7 s
Operating Conditions during Test
EF = 6.3 V, Ebb = 150 V, ECC = 0 V, Rk = 150 Ω, Rp = 2 kΩ
Limits
ERpm over vibration-frequency range of:
3 to 6 kc/s ............... = 80 mV
6 to 15 kc/s ............... = 700 mV
LIFE TESTS

Heater Cycling

Duration of Test ............... 2000 cycles
Operating Conditions
EF = 8.5 V cycled 1 minute ON and 2 minutes OFF, Ehk = -180 V continuously ON
Rejection Criteria
Heater-cathode shorts, and heater and cathode discontinuities
Intermittent Operation (2, 20, 100, 500, and 1000 Hours)

Operating Conditions

Ef = 6.3 cycled 110 minutes ON and 10 minutes OFF,
Ebb = 150 V, EEC = 0 V, Rg = 50 kΩ, Pb = 2.4 W,
TE = 150°C min

End-Point Limits At 2 and 20 100 500 1000

<table>
<thead>
<tr>
<th></th>
<th>2 and 20</th>
<th>100</th>
<th>500</th>
<th>1000</th>
</tr>
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<tbody>
<tr>
<td>1gm</td>
<td>-</td>
<td>-</td>
<td>6700</td>
<td>-</td>
</tr>
<tr>
<td>Δ1gm/t</td>
<td>±10</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Po(useful)</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>lC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

DIMENSIONAL OUTLINE
JEDEC No.4-6

Note 1: Maximum outside diameter of 0.440" is permitted along 0.190" lug length.
Note 2: Envelope temperature should be measured in zone "A".

MODIFIED BOTTOM VIEW
With Element Connections Indicated and Short Pin Not Shown

DATA 3
RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
Grid-Circuit-Resistance Rating Chart

MAXIMUM GRID-CIRCUIT RESISTANCE — kΩ

ENVELOPE TEMPERATURE (Tₑ) — °C

Breakdown-Voltage Characteristics

ALTITUDE — kft

AMBIENT TEMPERATURE (Tₐ) = 25°C
EFFECTS OF TUBE SOCKET, ENVELOPE TEMPERATURE, RADIATION, ETC. IGNORED.

INSTANTANEOUS BREAKDOWN VOLTAGE — V

AIR PRESSURE — mmHg

TOP CAP TO METAL SHELL

BASE PINS TO METAL SHELL

RADIO CORPORATION OF AMERICA
Electronic Components and Devices Harrison, N. J.
Typical Constant-Current Characteristics

$E_f = 6.3\, V$

$I_b = \text{DC PLATE CURRENT}$

$I_c = \text{DC GRID CURRENT}$

DC GRID VOLTAGE ($E_c$) — $V$

DC PLATE VOLTAGE ($E_b$) — $V$

DATA 4

RADIO CORPORATION OF AMERICA

Electronic Components and Devices

Harrison, N. J.
Typical Characteristics

$E_f = 6.3\, \text{V}$
**High Power Magnetron**

Ceramic-Metal Construction

**CW Oscillator**
30 Kilowatts at 915 MHz

**80% Efficiency**

**Liquid Cooled**

**MAGNETRON**

**ELECTRICAL**

Filament, Tungsten Coil

- AC Supply Voltage: 12.5 V
- Current@ at 12.5 volts: 115 A
- Starting Current: Must never exceed 250 amperes, even momentarily
- Cold resistance: 0.010 Ω
- Minimum heating time at normal filament voltage before anode voltage is applied: 10 s
- Center Frequency: 915 ± 15 MHz
- Focusing: Electromagnet, using AJ2134, AJ2134V1, or equivalent

**MECHANICAL**

- Operating Position: Vertical, either end up
- Maximum Overall Length: 18.25"
- Maximum Diameter: 4.94"
- Terminal Connections: See Dimensional Outline
- Weight (Approx.): 16 lbs

**THERMAL**

Ceramic-Insulator Temperature: 150 max. °C
Metal-Surface Temperature: 100 max. °C

**Air Cooling**

It is important that the temperature of any external part of the tube should not exceed the specified values. Uniform forced-air cooling of the output ceramic dome is required; with an RCA-AJ2134 or -AJ2134V1 Waveguide Adapter, approximately 20 cfm at 2.5 inches of water is adequate. Forced-air cooling of filament-terminal stem is also required. Approximately 5 cfm at 2 inches of water is required when using the RCA-AJ2137 Filament Connector. The air flow must start before application of the filament voltage and preferably should continue for several minutes after removal of the voltage. Interlocking of the air flow with the filament power supply is recommended to prevent tube damage in case of failure of adequate air flow.

**Liquid Cooling**

Liquid cooling of the anode is required. The liquid flow must start before application of the filament voltage and preferably...
Typical Water Flow to tube for 6 kW Anode Dissipation
Pressure Drop, at 3 gpm
Maximum Outlet Water Temperature
Maximum Inlet Water Pressure

CW OSCILLATOR

DC ANODE VOLTAGE
ANODE CURRENT
ANODE DISSIPATION
LOAD VSWR

Typical Operation at 915 MHz

AC Filament Voltage
Filament Current
DC Anode Voltage
Anode Current
DC Electromagnet Current
Useful Power Output
Efficiency

The filament is subjected to back bombardment during operation. This will increase the filament temperature and shorten tube life if left uncorrected. Therefore, the filament current should be reduced under operating conditions to a value that will give the same "hot filament resistance" as when no rf power is being generated. The operating filament current must be established in the following manner:

(1) With no anode voltage applied, set the filament current to 115 amperes without exceeding the starting current of 250 amperes. Calculate the "hot filament resistance" after the filament has stabilized (approximately 5 minutes) by dividing the applied filament voltage by the filament current.

(2) Apply power to the electromagnet (See Magnetron Operating Considerations, Electromagnet Operation), and then apply the desired anode voltage.
(3) Reduce the filament current in approximate 5-ampere steps until the "hot filament resistance" is the same as that calculated in Step 1. See Typical Operation data for approximate operating current.

(4) To restart the magnetron after the anode voltage has been removed, reset the filament current to 115 amperes, apply anode voltage and after the tube is generating power, reduce the filament current to the operating value determined in Step 3.

b The magnetic field must be turned "on" before application of the anode voltage and turned "off" only after removal of the anode voltage. For further details, see Waveguide Adapter.

c The anode is normally grounded.

d Refer to Typical Rieke Diagram for the effects of load VSWR on power output and frequency.

° At a load VSWR not exceeding 1.1:1.

MAGNETRON OPERATING CONSIDERATIONS

For considerations common to all RCA super-power tubes, see Application Guide for RCA Super Power Tubes, ICE-279A. Additional considerations specifically for the 8684 are given below.

Use of RF-Gasket

The rf connection between the magnetron and waveguide adapter is made by an rf gasket, RCA-AJ2138 or equivalent.

Harmonic Radiation Shielding

Harmonic energy may be radiated through the high-voltage and filament insulators. An rf shielded enclosure or suitable absorbing material may be required to reduce the harmonic radiation to acceptable levels.

Electromagnet Operation

To establish the electromagnet coil current when a tube is first installed, it is recommended that the electromagnet coil current be set at a value that will keep the magnetron anode current cut off when the anode voltage is applied. The typical electromagnet coil current necessary to achieve anode current cutoff with various anode potentials is shown in Fig. 2. In no case should the coil current exceed 4.0 amperes. After the anode voltage has been applied, the electromagnet coil current should be gradually reduced to give the required magnetron rf power output. The magnetron anode current and rf power output will increase slowly as the magnet coil current is gradually reduced.

When the tube is restarted after it has been shut down, the electromagnet coil current may be reset at the value determined above provided the coil is not connected in series with the magnetron anode supply. See Wave-Guide Adapter, Operating Considerations for electromagnet and tube operation with the coil connected in series with the magnetron anode supply.
RF-RADIATION WARNING

Because the 8684 is designed to generate high rf power levels at high frequencies, care must be taken to protect personnel from possible injury due to rf-radiation leakage.

Care must be exercised by the equipment designer and tube operator to insure that the rf seals obtained between the tube RF Output Terminal Contact Surface (See Dimensional Outline) and Waveguide Adapter, between waveguide flanges, and between the waveguide and rf probes are adequate to limit the rf leakage radiation to safe values.

CONNECTORS

RCA-AJ2137 is a connector for contacting the filament terminal of the magnetron. It contains a duct to permit forced-air cooling of the filament terminal, filament insulator, and the filament-cathode connector. This connector includes a 10-inch long braided lead with connector lug for 3/8-inch bolt.

RCA-AJ2136 is a connector for contacting the filament-cathode terminal of the magnetron. This connector includes a 10-inch long braided lead with connector lug for 3/8-inch bolt.

RCA-AJ2136V1 is a variant of the AJ2136 described above. It features a molded material which suppresses spurious radiation from the high-voltage insulator area of the magnetron.

AJ2137
AC or DC Current (typical) ...................... 115 A
Pressure Drop, at air flow of 5 ft 3/min ............... 2 inches of water

AJ2136
AC or DC Current (typical) ...................... 115 A
AJ2136V1
AC or DC Current (typical) ...................... 115 A
Spurious Radiation Attenuation:
Minimum ........................................ 10 dB
Typical ........................................ 12 dB

WAVEGUIDE ADAPTER

RCA-AJ2134 and AJ2134V1 Waveguide Adapters include the necessary electromagnet and rf circuitry for coupling rf energy from the 8684 to WR975 waveguide. The AJ2134 and the AJ2134V1 are identical except for the waveguide connector flange.

ELECTRICAL

DC Coil Voltage ...................... 39 V
Coil Current at 39 volts ...................... 3.0 A
Voltage Transients Across Electromagnet ........ Must never exceed 500 volts, even momentarily
MECHANICAL

Maximum Overall Length ........................................ 23.4"
Maximum Height ..................................................... 16.62"
Maximum Width ...................................................... 13.50"
Mounting Bracket .................................................. See Assembly Outline
Electromagnet Electrical Terminal Connection .......... See Assembly Outline
Electromagnet Coolant Connections ........................ See Assembly Outline
Weight (Approx.) ..................................................... 145 lbs.

THERMAL

Liquid Cooling

Liquid Cooling of the electromagnet coil is required. The liquid flow must start before application of the electromagnet voltage and preferably should continue for several minutes after removal of the voltage. Interlocking of the liquid flow with the electromagnet and the magnetron high voltage supply is recommended to prevent damage to the electromagnet and/or tube in case of failure of adequate liquid flow.

Typical Water Flow for coil dissipation of

140 watts ................................................................. 0.25 gpm

Maximum Pressure Drop, at 0.25 gpm ....................... 10 psi
Maximum Outlet Water Temperature ........................... 70 °C
Maximum Inlet Water Pressure .................................. 100 psig

Absolute-Maximum Ratings

DC Electromagnet Voltage ........................................ 50 V
DC Electromagnet Power .......................................... 190 watts

\(^f\) A shunt protection circuit such as provided by a thyrite is recommended for protecting the electromagnet from high voltage transients.
WAVEGUIDE ADAPTER OPERATING CONSIDERATIONS

See RCA-8684 Ratings for Typical Operation and Magnetron Operating Considerations. The electromagnet may be operated with a separate current-regulated power supply or it may be connected in series with the anode of the RCA-8684 magnetron, as shown in Fig.1, to minimize the sensitivity of the rf power output to anode voltage variations. In the series connected mode a separate power supply must also be connected to the electromagnet to (1) allow setting the coil current to the level required for proper tube operation (2) allow slight compensation for changes in the electromagnet coil resistance due to heat, and (3) permit the application and interruption of the magnetron anode voltage without creating excessive transient voltages across unprotected electromagnet coils.

To prevent damage to a non-protected electromagnet in the series connected mode, the magnetron anode voltage must neither be applied nor removed without first increasing the electromagnet coil current to a level that will keep the magnetron anode current cut off. The typical electromagnet coil current necessary to achieve anode current cutoff with various anode potentials is shown in Fig.2. Once the anode voltage is applied, the electromagnet coil current may be reduced to the required level by adjusting the output of the electromagnet supply. The magnetron anode current and rf power output will increase slowly as the coil current is gradually reduced.

SERIES CONNECTED POWER SUPPLY FOR ELECTROMAGNET OPERATION

![Diagram](image)

Fig.1
NOTE: Recommended direction of anode coolant flow: Duct #1 is "IN" and Duct #2 is "OUT" when tube is operated with Output Ceramic Dome UP. With Output Ceramic Dome DOWN, the flow should be reversed.
## ACCESSORIES

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJ2134</td>
<td>Waveguide Adapter; mates with EIA Standard CRP975F(WR975) Waveguide Flange.</td>
</tr>
<tr>
<td>AJ2134V1</td>
<td>Waveguide Adapter; mates with Alternate Waveguide Flange (See Flange on Assembly Outline.)</td>
</tr>
<tr>
<td>AJ2135</td>
<td>Magnetic Pole Piece</td>
</tr>
<tr>
<td>AJ2136</td>
<td>Filament-Cathode Connector</td>
</tr>
<tr>
<td>AJ2136V1</td>
<td>Filament-Cathode Connector with Molding</td>
</tr>
<tr>
<td>AJ2137</td>
<td>Filament Connector</td>
</tr>
<tr>
<td>AJ2138</td>
<td>RF Gasket</td>
</tr>
<tr>
<td>AJ2140</td>
<td>Accessory Kit including -AJ2135, -AJ2136, -AJ2137</td>
</tr>
<tr>
<td>AJ2141</td>
<td>Accessory Kit including -AJ2135, -AJ2136V1, -AJ2137</td>
</tr>
</tbody>
</table>

AJ2134 Waveguide Adapter flange mates with EIA standard CRP975F (WR975) waveguide flange

or

AJ2134V1 Waveguide Adapter flange mates with alternate flange shown below

![Diagram](image-url)
FIG. 2

ANODE VOLTAGE - KILOVOLTS

COIL CURRENT FOR ANODE CURRENT
CUT-OFF - AMPERES

COIL CURRENT VS. ANODE VOLTAGE

NOTE: The zero degree reference point is located at the plane of the waveguide connector flange on RCA-A42134 or A42134T waveguide adapters.

FREQUENCY IN MHZ
POWER IN MW

ANGULAR WAVELENGTH TOWARD LOAD

TYPICAL RIEKE DIAGRAM
TYPICAL PERFORMANCE CHARACTERISTICS

FREQUENCY IN MHz
RF POWER OUTPUT IN KW
ELECTROMAGNET CURRENT IN A

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>RF Power Output (kW)</th>
<th>Electromagnet Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>12.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11.0</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

ANODE VOLTAGE - kV
ANODE CURRENT - A

RCA Electronic Components

DATA 5
Fast Warmup Time  Pre-Tinned Heater Pins
Ceramic Metal, High-Mu Triode
Sturdy Coaxial-Electrode Structure

GENERAL
Heater, for Unipotential Cathode:
  Voltage (AC or DC) ........................................ 6.3 ± 10% V
  Current at 6.3 volts ....................................... 0.225 A
Cathode Warmup Time (Average)
  to reach 80% of operating power output as RF oscillator
  or amplifier .................................................. 5 s
Amplification Factor .......................................... 70
Transconductance, for dc plate current
  of 14 milliamperes, dc plate voltage
  of 125 volts, and cathode resistor
  of 50 ohms .................................................. 16,000 µS
Direct Interelectrode Capacitances:
  Grid to plate ............................................... 2.1 pF
  Grid to cathode and heater ............................... 4.4 pF
  Plate to cathode and heater ............................. 0.04 max. pF
Operating Position ........................................... Any
Dimensions and Terminal Connections  See Dimensional Outline
Weight (Approx.) ............................................... 0.3 oz

Sockets:
  Heater-Terminals Connector ......................... Grayhill^a No.22-5, or equivalent
  Socket for operation up to about
  550 MHz (Including heater-terminals
  connector) ................................................... Jettron^b No.CD7010, or equivalent
  Cavities (Including heater-terminals connector) ...... J-V-M^c No.D-7980 Series,
  Readel^d No.10 Series, AML, Inc.
  MCL, Inc.,^e or equivalent

RF POWER AMPLIFIER & OSC. - Class C Telegraphy^g
and
RF POWER AMPLIFIER - Class C FM Telephony
Maximum CCS^h Ratings, Absolute-Maximum Values up to 5 GHz:
  For Altitudes up to 100,000 feet
  DC Plate Voltage ............................................ 250 max. V
  DC Grid Voltage ............................................. -50 max. V
  DC Cathode Current ........................................ 25 max. mA
  DC Grid Current ............................................. 6 max. mA
  Grid Resistor ............................................... 0.25 max. MΩ
Plate Dissipation .................................. 2.5 max. W
Plate-Seal Temperature .......................... 225 max. °C
Peak Heater-Cathode Voltage:
Heater negative with respect to cathode .......... 50 max. V
Heater positive with respect to cathode .......... 50 max. V

Typical CCS Operation as Oscillator in Cathode-Drive Service:

<table>
<thead>
<tr>
<th>MHz</th>
<th>500</th>
<th>1,000</th>
<th>2,000</th>
<th>3,000</th>
<th>4,150</th>
<th>5,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage ........................</td>
<td>205</td>
<td>203</td>
<td>151</td>
<td>125</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage ........................</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>0.1</td>
<td>0.26</td>
<td>—</td>
</tr>
<tr>
<td>From a grid resistor of ..........................</td>
<td>1,000</td>
<td>600</td>
<td>250</td>
<td>500</td>
<td>130</td>
<td>100</td>
</tr>
<tr>
<td>DC Cathode Current ......................... 21</td>
<td>24</td>
<td>24</td>
<td>20</td>
<td>23</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>DC Grid Current ................................. 5</td>
<td>5</td>
<td>4</td>
<td>0.2</td>
<td>2</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.) ............. 1.6</td>
<td>1.3</td>
<td>0.5</td>
<td>0.15</td>
<td>0.1</td>
<td>0.03</td>
<td></td>
</tr>
</tbody>
</table>

Typical CCS Operation as Amplifier in Cathode-Drive Service:

<table>
<thead>
<tr>
<th>MHz</th>
<th>500</th>
<th>1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage ........................</td>
<td>204</td>
<td>185</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage ........................</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>From a grid resistor of ..........................</td>
<td>800</td>
<td>2,000</td>
</tr>
<tr>
<td>DC Cathode Current ......................... 21</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>DC Grid Current ................................. 5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Drive Power Input (Approx.) .................. 0.2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.) ............. 2.2</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>

FREQUENCY DOUBLER – Class C

Maximum CCS Ratings, Absolute-Maximum Values up to 2 GHz
For Altitudes up to 100,000 feet

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| DC Plate Voltage .............................. 250 max. V
| DC Grid Voltage ............................ -50 max. V
| DC Cathode Current ....................... 22 max. mA
| DC Grid Current ........................... 6 max. mA
| Grid Resistor ............................. 0.25 max. MΩ
**Plate Dissipation** .................................................. 2.5 max. W
**Plate-Seal Temperature** .......................................... 225 max. °C

**Peak Heater-Cathode Voltage:**
- Heater negative with respect to cathode ........................ 50 max. V
- Heater positive with respect to cathode .......................... 50 max. V

**Typical CCS Operation as Doubler in Cathode-Drive Service:**

<table>
<thead>
<tr>
<th></th>
<th>At 550 MHz</th>
<th>At 1,000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>193</td>
<td>207</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>18</td>
<td>7</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Drive Power Input (Approx.)</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Drive Power Output (Approx.)</td>
<td>1.3</td>
<td>0.75</td>
</tr>
</tbody>
</table>

**FREQUENCY TRIPLER – Class C**

**Maximum CCS Ratings, Absolute-Maximum Values** up to 2 GHz:
For Altitudes up to 100,000 feet

<table>
<thead>
<tr>
<th></th>
<th>At 645 MHz</th>
<th>At 1,000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>max.</td>
</tr>
<tr>
<td>DC Grid Voltage</td>
<td>-50</td>
<td>max.</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>20</td>
<td>max. mA</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>6</td>
<td>max. mA</td>
</tr>
<tr>
<td>Grid Resistor</td>
<td>0.25</td>
<td>max. Ω</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>2.5</td>
<td>max. W</td>
</tr>
<tr>
<td>Plate-Seal Temperature</td>
<td>225</td>
<td>max. °C</td>
</tr>
</tbody>
</table>

**Peak Heater-Cathode Voltage:**
- Heater negative with respect to cathode ........................ 50 max. V
- Heater positive with respect to cathode .......................... 50 max. V

**Typical CCS Operation as Tripler in Cathode-Drive Service:**

<table>
<thead>
<tr>
<th></th>
<th>At 645 MHz</th>
<th>At 1,000 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grid Voltage</td>
<td>202</td>
<td>240</td>
</tr>
<tr>
<td>DC Cathode-to-Grid Voltage</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>DC Cathode Current</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>DC Grid Current</td>
<td>3</td>
<td>0.6</td>
</tr>
<tr>
<td>Drive Power Input (Approx.)</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>CHARACTERISTICS RANGE VALUES</td>
<td>Note</td>
<td>Min.</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.205</td>
</tr>
<tr>
<td>Direct Interelectrode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>—</td>
<td>1.5</td>
</tr>
<tr>
<td>Grid to cathode</td>
<td>—</td>
<td>3.6</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Heater-Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage Current:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td>1.2</td>
<td>—</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater positive with</td>
<td>1.3</td>
<td>—</td>
</tr>
<tr>
<td>respect to cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage Resistance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From grid to plate and</td>
<td>1.4</td>
<td>100</td>
</tr>
<tr>
<td>cathode connected together</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From plate to grid and</td>
<td>1.5</td>
<td>100</td>
</tr>
<tr>
<td>cathode connected together</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse Grid Current</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Emission Voltage</td>
<td>7</td>
<td>—</td>
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<tr>
<td>Amplification Factor</td>
<td>1.8</td>
<td>55</td>
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<tr>
<td>Transconductance</td>
<td>1.8</td>
<td>12,500</td>
</tr>
<tr>
<td>Plate Current (1)</td>
<td>1.8</td>
<td>9</td>
</tr>
<tr>
<td>Plate Current (2)</td>
<td>1.9</td>
<td>—</td>
</tr>
<tr>
<td>Power Output</td>
<td>1.10</td>
<td>1.7</td>
</tr>
<tr>
<td>Change in Power Output</td>
<td>1,10,11</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1: With 6.3 volts ac or dc on heater.
Note 2: With 60 volts dc between heater and cathode, heater negative with respect to cathode.
Note 3: With 60 volts dc between heater and cathode, heater positive with respect to cathode.
Note 4: With grid 100 volts negative with respect to plate and cathode which are connected together.
Note 5: With plate 300 volts negative with respect to grid and cathode which are connected together.
Note 6: With dc plate voltage of 200 volts, dc grid voltage of -2 volts, grid resistor of 0.5 megohm.
Note 7: With dc voltage on grid and plate which are connected together and adjusted to produce a cathode current of 30 milliamperes, and with 5.5 volts on heater.
Note 8: With dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and cathode bypass capacitor of 1,000 microfarads.
Note 9: With dc plate voltage of 125 volts and dc grid voltage of −5 volts.

Note 10: In a single-tube, cathode-drive amplifier circuit operating at a frequency of approximately 550 ± 10 MHz, and with dc plate-to-cathode voltage of 250 volts, input-signal power of 0.2 watt, and dc grid voltage adjusted to produce a dc plate current of 20 milliamperes.

Note 11: Reduce heater voltage to 5.7 volts. Change in Power Output value from that obtained with 6.3 volts on heater will not exceed indicated value.

a Grayhill, Inc., 561 Hillgrove Ave., LaGrange, Ill.
b Jettron Products, Inc., 56 Route 10, Hanover, N.J.
c Fidelitone Microwave, Inc., JVM Division, 6415N. Ravenswood Ave., Chicago, Ill. Indicated number applies to a series of cavities covering the range from 220 to 3500 MHz.
d Resdel Engineering Corp., 990 South Fair Oaks Ave., Pasadena, Calif. This series of cavities covers the range from 215 to 2325 MHz.
e Applied Microwave Laboratory, Inc., 106 Albion St., Wakefield, Mass.
f Microwave Cavity Laboratory, Inc., 10 Beach Ave., LaGrange, Ill.
g Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio frequency envelope does not exceed 115 per cent of the carrier conditions.
h Continuous Commercial Service.

SPECIAL TESTS AND PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test

This test (similar to MIL-E-1) is performed on a sample lot of tubes every 90 days. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 100,000 feet. Breakdown will not occur when a 60-Hz rms voltage of 300 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run under the
following conditions: Heater voltage of 6.3 volts, dc plate-supply voltage of 125 volts, cathode resistor of 50 ohms, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 40 Hz at an acceleration of 10 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

At the end of this test the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Negative Grid Current \((-I_C)\) \(\ldots \ldots \ldots \ldots 1 \text{ max. } \mu A\)

For conditions shown under Characteristics Range Values, Note 1.

Variable-Frequency Vibration Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run. Tube operating conditions are the same as for Low-Frequency Vibration. The tubes are vibrated perpendicular to the major axis through a frequency range from 5 to 500 Hz and back. From 5 to 50 Hz, the tubes are vibrated at a constant displacement of 0.0400 \(\pm\) 0.0025 inch. From 50 to 500 Hz, the tubes are vibrated at a constant acceleration of 10 \(\pm\) 2 g. Total time to complete a sweep cycle is 10 \(\pm\) 5 minutes. During the test, the tubes will not show an rms output voltage across the plate load resistor in excess of 150 millivolts.

Each tube is vibrated for 60 seconds at the frequency which gives maximum vibrational noise output. If, at the end of 60 seconds, the vibrational noise output is still increasing, the test is continued until there is no further increase.

The rms output voltage across the plate load resistor as a result of the vibration of the tube will not exceed the specified limit at any time during the test.
At the end of the test the tubes will not show permanent shorts or open circuits and will meet the following test limit:

Negative Grid Current ($-I_C$) ............. 1 max. μA

For conditions shown under Characteristics Range Values, Note 1.

Shock Test

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run. Tubes are held rigid and are subjected in three different positions to an impact acceleration of 500 g, 5 blows in each position.

At the end of this test, tubes will not show permanent shorts or open circuits and will meet the following limits:

Negative Grid Current ($-I_C$) ............. 1 max. μA

For conditions shown under Characteristics Range Values, Note 1.

Heater-Cathode Leakage Current ........ 60 max. μA

For conditions shown under Characteristics Range Values, Notes 1, 3.

Low-Frequency Vibration Output ........ 200 max. mV

For conditions shown above under Low-Frequency Vibration Performance.

Change in transconductance ............ -20 max. %

From initial value for conditions shown under Characteristics Range Values, Notes 1, 8.

Fatigue Vibration Test

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected to 2.5 g vibrational acceleration in two positions (X1, Y1) for 32 hours each. At the end of this test, tubes are required to meet the limits specified for the Shock Test.
Shorts and Continuity Test

This test (similar to MIL-E-1) is performed on all tubes from each production run. Voltage applied between adjacent elements of the tube under test will be between 20 and 70 volts dc or peak ac. Plate and cathode terminals are tied together and connected to the grid terminal through the shorts test equipment. Tubes are tapped with a rubber tapper three times in each of three mutually perpendicular directions. If a short indication is obtained, the tapping cycle is repeated two times for verification. Acceptance criteria is based on the "Resistance vs. Time Duration" curve shown in MIL-E-1.

At the end of this test, the tubes will not show permanent shorts or open circuits and will meet the following limit:

Negative Grid Current (I_C) \( \leq 1 \text{ max. } \mu \text{A} \)

For conditions shown under Characteristics Range Values, Note 1.

Ceramic Seal Fracture Test

This test is performed on a sample lot of tubes every 90 days. With cathode- and plate-cylinder-supports spaced 15/16 ± 1/64 inch (23.812 ± 3.96 mm), and with the grid flange centered between these supports, the tubes will withstand the gradual application of a force of 30 pounds (13.6 kilograms), perpendicular to the axis of the tubes, upon the grid flange, without causing fracture of the ceramic insulation.

Seal Strain Test

This test (similar to MIL-E-1) is performed on a sample lot of tubes every 90 days. Tubes are tested by first immersing in water having a temperature of at least 97°C for at least 15 seconds and then immersing immediately in water at not more than 5°C for 5 seconds.

After drying for 48 hours at room temperature, the tubes will meet the following test limits:
Heater-Cycling Life Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run. With 6.3 volts on heater and no voltage on plate or grid, the heater is cycled three minutes on and three minutes off for at least 2,000 cycles.

At the end of this test, tubes will not show permanent shorts or open circuits, and are required to meet the following limits:

Negative Grid Current (-Ic) .............. 1 max. µA
For conditions shown under Characteristics Range Values, Note 1.

Heater-to-Cathode Leakage Current .... 30 max. µA
For conditions shown under Characteristics Range Values, Notes 1, 3.

Grid-to-Cathode Leakage Resistance ... 50 min. MΩ
For conditions shown under Characteristics Range Values, Notes 1, 4.

1-Hour Stability Life Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: Heater voltage of 6.3 volts, plate-supply voltage of 215 volts, and cathode resistor of 150 ohms.

At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15 percent of the initial value, for conditions shown under Characteristics Range Values, Notes 1, 8.

In addition the tubes will not show permanent shorts or open circuits and will meet the following limit:
Negative Grid Current (-Ic) .............. 1 max. µA
For conditions shown under Characteristics Range Values, Note 1.

100-Hour Survival Life Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for 1-Hour Stability Life Performance except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off.

At the end of 100 hours, the tubes will not show permanent shorts or open circuits and will meet the following limits:

Negative Grid Current (-Ic) \( \leq \) 1 max. \( \mu A \)

For conditions shown under Characteristics Range Values, Note 1.

Transconductance \( \geq \) 9,000 min. \( \mu S \)

For conditions shown under Characteristics Range Values, Notes 1, 8.

Plate Current (2) \( \leq \) 50 max. \( \mu A \)

For conditions shown under Characteristics Range Values, Notes 1, 9.

500- and 1000-Hour Dynamic Life Performance

This test (similar to MIL-E-1) is performed on a sample lot of tubes from each production run to insure high-quality rf performance. Each tube is life-tested as a Class C amplifier in special cavity at 550 ± 10 MHz under the following conditions: Heater voltage of 6.3 volts; plate-supply voltage of 250 volts; cathode resistor adjusted to give plate current of 25 milliamperes; and grid-circuit resistance adjusted to give grid current of 6 milliamperes, heater positive with respect to cathode by 67.5 volts, and plate-seal temperature of 225\( ^\circ \) C. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tubes will not show permanent shorts or open circuits, and will be criticized...
for total number of tubes failing to pass the following limits:

Negative Grid Current ($-I_C$) ................ 1 max. $\mu$A

For conditions shown under Characteristics Range Values, Note 1.

Leakage Resistance:

From grid to plate and cathode connected together ........... 60 min. M$\Omega$

From plate to grid and cathode connected together ........... 60 min. M$\Omega$

For conditions shown under Characteristics Range Values, Notes 1, 4, and 1, 5.

Power Output .................. 1.5 min. W

For conditions shown under Characteristics Range Values, Notes 1, 10.

At the end of 1,000 hours, the tubes will not show permanent shorts or open circuits and will be criticized for total number of tubes failing to pass the following limits:

Negative Grid Current ($-I_C$) ................ 1 max. $\mu$A

For conditions shown under Characteristics Range Values, Note 1.

Power Output .................. 1.3 min. W

For conditions shown under Characteristics Range Values, Notes 1, 10.

OPERATING CONSIDERATIONS

Connections to the cathode cylinder, grid flange, and plate cylinder should be made by flexible spring contacts. The connectors should make firm large-surface contact, yet must be sufficiently flexible to insure that no part of the tube is subjected to excessive strain.

The cathode should be connected to one side of the heater. In some circuit designs, when the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum rated values shown in the tabulated data.
Reference plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts. Annular surface "B" is on the side of the grid flange toward the cathode cylinder. Annular surface "C" is on the side of the grid flange toward the plate cylinder.

**DIMENSIONAL OUTLINE**

- **H**: Heater Pin
- **K**: Cathode Cylinder (Adjacent to Heater Pins)
- **G**: Grid Flange
- **P**: Plate Cylinder (Adjacent to pinch-off)

Reference plane "A" is defined as that plane against which annular surface "B" of the grid flange abuts. Annular surface "B" is on the side of the grid flange toward the cathode cylinder. Annular surface "C" is on the side of the grid flange toward the plate cylinder.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Inches</th>
<th>Millimeters</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td>Min.</td>
</tr>
<tr>
<td>A</td>
<td>-</td>
<td>0.230</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>0.180</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>0.555</td>
<td>0.605</td>
<td>14.10</td>
</tr>
<tr>
<td>D</td>
<td>0.165</td>
<td>0.205</td>
<td>4.19</td>
</tr>
<tr>
<td>E</td>
<td>0.049</td>
<td>0.055</td>
<td>1.245</td>
</tr>
<tr>
<td>F</td>
<td>0.120</td>
<td>0.150</td>
<td>3.05</td>
</tr>
<tr>
<td>G</td>
<td>0.535</td>
<td>0.575</td>
<td>13.59</td>
</tr>
<tr>
<td>H</td>
<td>0.320</td>
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<td>8.13</td>
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<tr>
<td>J</td>
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<td>6.223</td>
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<td>K</td>
<td>-</td>
<td>0.115</td>
<td>-</td>
</tr>
<tr>
<td>L</td>
<td>0.335</td>
<td>0.355</td>
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<tr>
<td>M</td>
<td>0.048</td>
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<tr>
<td>N</td>
<td>0.547</td>
<td>0.557</td>
<td>13.894</td>
</tr>
<tr>
<td>O</td>
<td>-</td>
<td>0.010</td>
<td>-</td>
</tr>
<tr>
<td>P</td>
<td>0.095</td>
<td>0.125</td>
<td>2.41</td>
</tr>
<tr>
<td>Q</td>
<td>-</td>
<td>1.360</td>
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</tr>
<tr>
<td>R</td>
<td>0.095</td>
<td>0.135</td>
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<tr>
<td>S</td>
<td>0.020</td>
<td>0.030</td>
<td>0.508</td>
</tr>
<tr>
<td>T</td>
<td>0.650</td>
<td>0.700</td>
<td>16.51</td>
</tr>
<tr>
<td>U</td>
<td>0.060</td>
<td>-</td>
<td>1.52</td>
</tr>
</tbody>
</table>

**NOTE 1:** With annular surface "B" resting on reference plane "A", the axis of the cathode cylinder will be within 2° of a line perpendicular to reference plane "A".

**NOTE 2:** The axes of the plate cylinder and cathode cylinder will coincide within 0.010".

**NOTE 3:** The axes of the cathode cylinder and grid flange will coincide within 0.005".

**NOTE 4:** The diameter along the 0.320" minimum length is measured with "go" and "no-go" ring gauges G1-1 and G1-2, respectively.

**NOTE 5:** This diameter is measured with "go" and "no-go" gauges G3-1 and G3-2, respectively.
TYPICAL POWER OUTPUT vs. HEATER VOLTAGE (550-MHz OPERATION)

OPERATION = CLASS C
INPUT FREQUENCY = 550MHz
PLATE VOLTAGE ($E_p$) = 200 V
PLATE CURRENT ($I_p$) = 25 mA

TYPICAL PLATE-SEAL TEMPERATURE vs. PLATE DISSIPATION

HEATER VOLTAGE ($E_f$) = 6.3 $V_{\text{RMS}}$
LUMPED - CONSTANT SOCKET
AVERAGE PLATE OR GRID CURRENT CHARACTERISTICS
vs. PLATE-TO-GRID VOLTAGE
FOR CATHODE DRIVE SERVICE

CATHODE-DRIVE SERVICE
HEATER VOLTAGE (E_h) = 6.3 V_{RMS}

PLATE CURRENT (I_p) OR GRID CURRENT (I_c) - mA

PLATE-TO-GRID VOLTAGE (E_{pg}) - V

92CM-10262RI
AVERAGE CONSTANT-CURRENT CHARACTERISTICS FOR CATHODE DRIVE SERVICE

CATHODE-DRIVE SERVICE
HEATER VOLTAGE ($E_h$) = 6.3 $V_{(RMS)}$

GRID CURRENT ($I_C$) = 50mA
PLATE CURRENT ($I_b$) = 70mA

PLATE-TO-GRID VOLTAGE ($E_{gp}$) – V
CATHODE-TO-GRID VOLTAGE ($E_{kg}$) – V

92CM-10263R2
VHF-TV Amplifier Tube

1000W Peak Sync. Output in VHF-TV Service

CERMOLOX®

Ruggedized, Reliable
 Forced-Air Cooled
 Full Input to 400 MHz
 Matrix Oxide Cathode

ELECTRICAL

Heater-Cathode:
Type .............. Unipotential, Oxide Coated, Matrix Type
Voltage (ac or dc) ....... \{ 6.3 typ. V
.................. 6.6 max. V
Current at 6.3 volts ........ 7.5 A
Minimum Heating Time ....... 120 s
Mu-Factor, (Grid No.2 to Grid No.1) ........ 13

GRID-MODULATED RF POWER AMPLIFIER—CLASS C TELEVISION SERVICE

Maximum CCS Ratings, Absolute-Maximum Values Up to 216 MHz
DC Plate Voltage ......................... 3000 V
DC Grid No. 2 Voltage ................. 750 V
DC Grid No. 1 Voltage (white level) ..... -250 V
DC Plate Current ....................... 750 mA
Grid No. 2 Input ....................... 25 W
Plate Dissipation ..................... 1000 W
Grid No. 1 Current ................. 100 mA

MECHANICAL

Operating Position ..................... Any
Weight (Approx.) ...................... 3/4 lb (0.3 kg)

THERMAL

Seal Temperaturec (Plate, Grid No.2, Grid No.1, Cathode-Heater and Heater) ........ 250 max. ºC
Plate-Core Temperature .................. 250 max. ºC

a See Dimensional Outline for temperature measurement points.
b Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes.

detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
VHF-TV Amplifier Tube

1350W Peak Sync. Output in VHF-TV Service

CERMOLOX®
Sturdy, Reliable

Matrix Oxide Cathode

**ELECTRICAL**

Heater-Cathode:

<table>
<thead>
<tr>
<th>Type</th>
<th>Unipotential, Oxide Coated, Matrix Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage(^a) (ac or dc)</td>
<td>(5.5) typ.  V (5.8) max.  V</td>
</tr>
<tr>
<td>Current (@ 5.5 V)</td>
<td>(17.3) A</td>
</tr>
<tr>
<td>Minimum heating time</td>
<td>(180) s</td>
</tr>
<tr>
<td>Mu Factor(^b) (Grid No.1 to Grid No.2)</td>
<td>(6.5)</td>
</tr>
</tbody>
</table>

**GRID-MODULATED RF POWER AMPLIFIER—CLASS C TELEVISION SERVICE**

**MAXIMUM CCS RATINGS, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Up to 400 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltages</td>
</tr>
<tr>
<td>DC Grid-No. 2 Voltages</td>
</tr>
<tr>
<td>DC Plate Current</td>
</tr>
<tr>
<td>Grid-No. 2 Input</td>
</tr>
<tr>
<td>Plate Dissipation</td>
</tr>
<tr>
<td>Grid-No. 1 Current</td>
</tr>
</tbody>
</table>

**MECHANICAL**

Operating Position.................. Any

Weight (Approx.)..................... 2 lbs (0.9 kg)

**THERMAL**\(^a\)

| Seal Temperature               | \(250\) max. °C |
| Plate Core Temperature         | \(250\) max. °C |

\(^a\) See Dimensional Outline for temperature measurement points.

\(^b\) 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 RCA Power Tube Application Engineering, Lancaster, Pa., for guidance.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
### Table of Dimensions

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.72 ± .03</td>
<td>(94.49 ± .76) Dia.</td>
</tr>
<tr>
<td>B Min.</td>
<td>3.210</td>
<td>(81.54) Dia.</td>
</tr>
<tr>
<td>C Min.</td>
<td>3.010</td>
<td>(76.45) Dia.</td>
</tr>
<tr>
<td>D Min.</td>
<td>2.307</td>
<td>(58.60) Dia.</td>
</tr>
<tr>
<td>E Min.</td>
<td>1.710</td>
<td>(43.41) Dia.</td>
</tr>
<tr>
<td>F Max.</td>
<td>0.725</td>
<td>(18.41) Dia.</td>
</tr>
<tr>
<td>G</td>
<td>3.24 ± .10</td>
<td>(82.3 ± 2.5)</td>
</tr>
<tr>
<td>H</td>
<td>2.78 ± .07</td>
<td>(70.61 ± 1.78)</td>
</tr>
<tr>
<td>J</td>
<td>2.19 ± .04</td>
<td>(55.63 ± 1.02)</td>
</tr>
<tr>
<td>K Min.</td>
<td>0.85</td>
<td>(21.59)</td>
</tr>
<tr>
<td>M</td>
<td>1.160 ± .005</td>
<td>(29.464 ± .000)</td>
</tr>
<tr>
<td>N</td>
<td>0.82 ± .03</td>
<td>(20.83 ± .76)</td>
</tr>
<tr>
<td>P</td>
<td>0.200 ± .025</td>
<td>(5.08 ± .63)</td>
</tr>
<tr>
<td>R</td>
<td>0.37 ± .03</td>
<td>(9.40 ± .76)</td>
</tr>
<tr>
<td>S</td>
<td>0.46 ± .03</td>
<td>(11.68 ± .76)</td>
</tr>
<tr>
<td>T Min.</td>
<td>0.200</td>
<td>(5.08)</td>
</tr>
<tr>
<td>U Min.</td>
<td>0.250</td>
<td>(6.35)</td>
</tr>
<tr>
<td>V Min.</td>
<td>0.105</td>
<td>(2.66)</td>
</tr>
</tbody>
</table>
Beam Power Tube

CERMOLOX

5,000 Watts PEP Output
10,000 Watts Output
Full Input to 400 MHz
Telegraphy or FM Telephony
Sturdy, Reliable, Thoriated Tungsten, Mesh Filaments

ELECTRICAL

Filamentary Cathode:
Type: Thoriated-Tungsten Mesh
Voltage (ac or dc): 5.7 typ-6.0 max. V
Current:
Typical value at 5.7 volts: 125 A
Maximum value for starting even momentarily: 300 A
Cold Resistance: 0.005 Ω
Minimum heating time: 15 s
Mu-Factor (Grid No.2 to Grid No.1): 10

MAXIMUM CCS RATINGS, Absolute-Maximum Values:
Up to 400 MHz
DC Plate Voltage: 7000 V
DC Grid-No.2 Voltage: 1500 V
DC Plate Current at Peak of Envelope: 40 A
Plate Dissipation: 5.0 kW

MECHANICAL

Operating Position: Vertical, either end up
Weight (Approx.): 6 lb (2.7 kg)

THERMAL

Seal Temperature: 250 max. °C
Plate-Core Temperature: 250 max. °C

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.

- See Dimensional Outline for temperature measurement points.
- Keep all stippled regions clear. Do not allow contact or circuit components to intrude into these annular volumes.
### DIMENSIONAL OUTLINE

#### AIR COOLED RADIATOR

#### PLATE TERMINAL

#### GRID-No.2 TERMINAL

#### GRID-No.1 TERMINAL

#### HEATER-CATHODE TERMINAL

#### HEATER TERMINAL

---

SEE FOOTNOTE(b) CERAMIC

---

#### TEMPERATURE MEASUREMENT POINT

---

92LM-2542V

---

#### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>4.570 Max.</td>
<td>116.07 Max.</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.235 Min.</td>
<td>82.17 Min.</td>
</tr>
<tr>
<td>C Dia.</td>
<td>3.014 Min.</td>
<td>76.52 Min.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>2.307 Min.</td>
<td>58.60 Min.</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.840 Min.</td>
<td>46.74 Min.</td>
</tr>
<tr>
<td>F Dia.</td>
<td>1.210 Max.</td>
<td>30.73 Max.</td>
</tr>
<tr>
<td>G</td>
<td>4.795 ± .080</td>
<td>121.79 ± 2.03</td>
</tr>
<tr>
<td>H</td>
<td>4.140 ± .050</td>
<td>105.16 ± 1.27</td>
</tr>
<tr>
<td>J</td>
<td>1.940 ± .040</td>
<td>49.28 ± .101</td>
</tr>
<tr>
<td>K</td>
<td>1.330 ± .030</td>
<td>33.78 ± .76</td>
</tr>
<tr>
<td>M</td>
<td>0.200 ± .025</td>
<td>5.08 ± .63</td>
</tr>
<tr>
<td>N</td>
<td>0.475 ± .035</td>
<td>12.06 ± .88</td>
</tr>
<tr>
<td>P</td>
<td>0.650 ± .030</td>
<td>16.51 ± .76</td>
</tr>
</tbody>
</table>
# Beam Power Tube

## CERMOLOX

10,000 Watts PEP Output  
15,000 Watts Output  
Full Input to 400 MHz  
Telegraphy or FM Telephony  
Sturdy, Reliable, Thoriated Tungsten, Mesh Filaments

### ELECTRICAL

Filamentary Cathode:
- **Type**: Thoriated-Tungsten Mesh
- **Voltage (AC or DC)**: 5.7 typ–6.0 max. V
- **Current**:
  - Typical value at 5.7 volts: 125 A  
  - Maximum value for starting even momentarily: 300 A
  - Cold Resistance: 0.005 Ω
  - Minimum heating time: 15 sec  
  - Mu-Factor, (Grid-No.2 to Grid-No.1): 10

### MAXIMUM CCS RATINGS, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>8000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1650 V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>4.0 A</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>12.5 kW</td>
</tr>
</tbody>
</table>

### MECHANICAL

- **Operating Position**: Vertical, either end up
- **Weight (Approx.)**: 10 lb (4.54 kg)

### THERMAL

- **Seal Temperature (Plate, grid No.2, grid No.1, cathode heater, 2nd heater)**: 250 max. °C
- **Plate-Core Temperature**: 250 max. °C

---

a See *Dimensional Outline* for temperature measurement points.
b Keep all stippled regions clear. Do not allow contacts or circuit components to protrude into these annular volumes. Diameters of stippled areas above air-cooled radiator, plate terminal contact surface, and grid-No.2 terminal contact surface shall not be greater than its associated diameter.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, NJ 07029.
### DIMENSIONAL OUTLINE

![Diagram of air-cooled radiator with dimensions marked]

**DIMENSION** | **INCHES** | **MILLIMETERS**
--- | --- | ---
A Dia. | 6.135 ± 0.035 | 155.83 ± 0.88
B Dia. | 3.235 Min. | 82.17 Min.
C Dia. | 3.014 Min. | 76.56 Min.
D Dia. | 2.307 Min. | 58.60 Min.
E Dia. | 1.840 Min. | 46.74 Min.
F Dia. | 1.210 Max. | 30.73 Max.
G | 5.370 ± 0.080 | 136.4 ± 2.0
H | 4.715 ± 0.050 | 119.7 ± 1.2
J | 1.940 ± 0.040 | 49.28 ± 1.01
K | 1.330 ± 0.030 | 33.78 ± 0.76
M | 0.200 ± 0.025 | 5.08 ± 0.63
N | 0.475 ± 0.030 | 12.06 ± 0.76
P | 0.650 ± 0.030 | 16.51 ± 0.76

*SEE FOOTNOTE (b)  CERAMIC  TEMPERATURE MEASUREMENT POINT

92LM-2544V
Beam Power Tube

CERMOLOX  12.5 kW Peak Sync Output
Full Input to 400 MHz thru VHF-TV High Band
2.5 kW Carrier for Linear Operation

ELECTRICAL

Filamentary Cathode:
Type .................................................. Thoriated-Tungsten Mesh
Voltage (ac or dc) .......................... 5.7 typ.-6.0 max. V
Current:
Typical value at 5.7 volts ................. 125 A
Maximum value for starting even momentarily ........................................... 300 A
Cold Resistance ...................................... 0.005 Ω
Minimum heating time ....................... 15 s
Mu-Factor (Grid No.2 to Grid No.1) ........ 20

MAXIMUM CCS RATINGS, Absolute-Maximum Values

DC Plate Voltage .................................. 8000 max. V
DC Grid-No.2 Voltage ......................... 1650 max. V
DC Grid-No.1 Voltage ......................... -450 max. V
DC Plate Current .................................. 4.0 max. A
Grid-No.1 Input .................................... 150 max. W
Grid-No.2 Input .................................... 250 max. W
Plate Dissipation ................................ 12500 max. W

MECHANICAL

Operating Position ............................. Vertical, either end up
Weight (Approx.) .................................. 10 lb (4.54 kg)

THERMAL

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

See *Dimensional Outline* for temperature measurement points.
Keep all stripped regions clear. Do not allow contacts or circuit components to protrude into these annular regions.

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
### DIMENSIONAL OUTLINE

**DIMENSION** | **INCHES** | **MILLIMETERS**
---|---|---
A Dia. | 6.135 ± .035 | 155.83 ± .88
B Dia. | 3.235 Min. | 82.17 Min.
C Dia. | 3.014 Min. | 76.56 Min.
D Dia. | 2.307 Min. | 58.60 Min.
E Dia. | 1.840 Min. | 46.74 Min.
F Dia. | 1.210 Max. | 30.73 Max.
G | 5.370 ± .080 | 136.4 ± 2.0
H | 4.715 ± .050 | 119.7 ± 1.2
J | 1.940 ± .040 | 49.28 ± 1.01
K | 1.330 ± .030 | 33.78 ± .76
M | 1.005 ± .020 | 25.53 ± .51
N | 0.200 ± .025 | 5.08 ± .63
P | 0.475 ± .030 | 12.06 ± .76
R | 0.650 ± .030 | 16.51 ± .76
**Beam Power Tube**

**CERMOLOX**

20 kW Peak Sync Output

Forced-Air-Cooled

3.75 kW Carrier for Linear Operation

### ELECTRICAL

Filamentary Cathode, Thoriated-Tungsten Mesh Type:

<table>
<thead>
<tr>
<th>Voltage (ac or dc)</th>
<th>9.5 typ. V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current:</td>
<td>10.0 max. V</td>
</tr>
<tr>
<td>Typical value at 9.5 volts</td>
<td>145 A</td>
</tr>
<tr>
<td>Maximum value for starting, even momentarily</td>
<td>300 A</td>
</tr>
<tr>
<td>Cold Resistance</td>
<td>0.01 Ω</td>
</tr>
<tr>
<td>Minimum heating time</td>
<td>15 s</td>
</tr>
<tr>
<td>Mu-Factor (Grid No.2 to Grid No.1)</td>
<td>10</td>
</tr>
</tbody>
</table>

### MAXIMUM CCS RATINGS, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10,000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>2000 max. V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>6.0 max. A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>500 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>450 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>15 max. kW</td>
</tr>
</tbody>
</table>

### MECHANICAL

Operating Position: Vertical, either end up

Weight (Approx.): 12 lb (5.5 kg)

### THERMAL

Seal Temperature: 250 max. °C

Plate-Core Temperature: 250 max. °C

---

*See Dimensional Outline for temperature measurement points.

*Keep all stripped regions clear. Do not allow contacts or circuit components to protrude into these annular regions.*

---

Detailed performance and application information is available through your RCA Sales Office, Distributor, or write to RCA Commercial Engineering, Harrison, N.J. 07029.
### Dimensional Outline

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>7.075 ± .035</td>
<td>179.71 ± .89</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.235 Min.</td>
<td>82.17 Min.</td>
</tr>
<tr>
<td>C Dia.</td>
<td>3.014 Min.</td>
<td>76.56 Min.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>2.307 Min.</td>
<td>58.60 Min.</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.840 Min.</td>
<td>46.74 Min.</td>
</tr>
<tr>
<td>F Dia.</td>
<td>1.210 Max.</td>
<td>30.73 Max.</td>
</tr>
<tr>
<td>G Dia.</td>
<td>1.314 Min.</td>
<td>33.38 Min.</td>
</tr>
<tr>
<td>H Dia.</td>
<td>0.620 Max.</td>
<td>15.75 Max.</td>
</tr>
<tr>
<td>J</td>
<td>7.345 Max.</td>
<td>186.56 Max.</td>
</tr>
<tr>
<td>K</td>
<td>6.30 Max.</td>
<td>160.0 Max.</td>
</tr>
<tr>
<td>M</td>
<td>5.50 Ref.</td>
<td>139.7 Ref.</td>
</tr>
<tr>
<td>N</td>
<td>2.04 ± .04</td>
<td>51.8 ± 1.0</td>
</tr>
<tr>
<td>P</td>
<td>1.33 ± .03</td>
<td>33.8 ± .8</td>
</tr>
<tr>
<td>R</td>
<td>0.325 Ref.</td>
<td>8.26 Ref.</td>
</tr>
<tr>
<td>S</td>
<td>0.200 ± .025</td>
<td>5.08 ± .63</td>
</tr>
<tr>
<td>T</td>
<td>0.50 ± .03</td>
<td>12.7 ± .8</td>
</tr>
<tr>
<td>U</td>
<td>0.76 ± .04</td>
<td>19.3 ± 1.0</td>
</tr>
<tr>
<td>V</td>
<td>0.25 Ref.</td>
<td>6.4 Ref.</td>
</tr>
</tbody>
</table>

**RCA Electronic Components**

**DATA**
C Band Klystron

- Gang Tuned Cavities
- Air Cooled
- High Efficiency
- High Power Gain
- Compact
- Sturdy

**Frequency**

4.4 to 5.0 GHz

**Electrical:**

- Cathode: Indirectly-heated Tungsten Dispenser Cathode
- Filament:
  - Voltage: 6.5 ± 0.5 V
  - Current at 6.5 V: 7.6 A
  - Maximum current: 8.2 A
  - Warmup time (min.): 180 s

**Mechanical:**

- Mounting Position: Any
- Length (max.): (393 mm) 15.5 in
- Width (max.): (267 mm) 10.5 in
- Weight (approx.):
  - In commercial pack: (17.2 kg) 38 lb
  - In military pack: (18.1 kg) 40 lb
  - (22.5 kg) 50 lb

**Thermal:**

- Collector Temperature (max.): 260 °C
- Body Temperature (max.): 150 °C
- Tuner Fin Temperature (max.): 150 °C
- Electron Gun Potting
  - Insulation temperature (max.): 250 °C
  - Storage temperature (min.): -65 °C

**Cooling:**

Forced air flow across the collector, body, and tuner, is required.

Typical air requirements for operation with 20° C ambient air temperature at sea level are:

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Reg</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Flow</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector</td>
<td>7.5</td>
<td>3.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Body &amp; Tuners</td>
<td>0.85</td>
<td>0.38</td>
<td>0.75</td>
</tr>
</tbody>
</table>

**Data**

RCA Electronic Components
### Performance

**Maximum CW Ratings, Absolute-Maximum Values:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Beam Voltage</td>
<td>8.5 kV</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>600 mA</td>
</tr>
<tr>
<td>DC Body Current</td>
<td>60 mA</td>
</tr>
<tr>
<td>Surge Current</td>
<td>25 A</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>2.0:1</td>
</tr>
<tr>
<td>Input VSWR</td>
<td>2.0:1</td>
</tr>
</tbody>
</table>

**Typical CW Operation:**

**High Efficiency Tuned**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>DC Beam Voltage</th>
<th>DC Beam Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 GHz</td>
<td>8.0 kV</td>
<td>520.0 mA</td>
</tr>
<tr>
<td>5.0 GHz</td>
<td>8.0 kV</td>
<td>520.0 mA</td>
</tr>
</tbody>
</table>

**Typical CW Operation (cont'd.)**

**High Efficiency Tuned**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>DC Body Current</th>
<th>RF Power Output</th>
<th>Bandwidth (3 dB)</th>
<th>Efficiency</th>
<th>Gain</th>
<th>Drive</th>
<th>Load VSWR</th>
<th>Input VSWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 GHz</td>
<td>10.0 mA</td>
<td>1.60 kW</td>
<td>8.0 MHz</td>
<td>39.0 %</td>
<td>45.0 dB</td>
<td>50.0 mW</td>
<td>1.05:1</td>
<td>1.3:1</td>
</tr>
<tr>
<td>5.0 GHz</td>
<td>10.0 mA</td>
<td>1.45 kW</td>
<td>10.0 MHz</td>
<td>35.0 %</td>
<td>45.0 dB</td>
<td>50.0 mW</td>
<td>1.05:1</td>
<td>1.3:1</td>
</tr>
</tbody>
</table>

**High Gain Tuned**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>DC Beam Voltage</th>
<th>DC Beam Current</th>
<th>DC Body Current</th>
<th>RF Power Output</th>
<th>Bandwidth (3 dB)</th>
<th>Efficiency</th>
<th>Gain</th>
<th>Drive</th>
<th>Load VSWR</th>
<th>Input VSWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4 GHz</td>
<td>8.0 kV</td>
<td>520.0 mA</td>
<td>10.0 mA</td>
<td>1.45 kW</td>
<td>6.0 MHz</td>
<td>35.0 %</td>
<td>52.0 dB</td>
<td>10.0 mW</td>
<td>1.05:1</td>
<td>1.3:1</td>
</tr>
<tr>
<td>5.0 GHz</td>
<td>8.0 kV</td>
<td>520.0 mA</td>
<td>10.0 mA</td>
<td>1.30 kW</td>
<td>8.0 MHz</td>
<td>31.0 %</td>
<td>52.0 dB</td>
<td>10.0 mW</td>
<td>1.05:1</td>
<td>1.3:1</td>
</tr>
</tbody>
</table>

---

**RCA Electronic Components**

**DATA 1**
Broadband Tuned

<table>
<thead>
<tr>
<th>Parameter</th>
<th>4.4 GHz</th>
<th>5.0 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>4.4 GHz</td>
<td>5.0 GHz</td>
</tr>
<tr>
<td>DC Beam Voltage</td>
<td>8.0 kV</td>
<td>8.0 kV</td>
</tr>
<tr>
<td>DC Beam Current</td>
<td>520.0 mA</td>
<td>520.0 mA</td>
</tr>
<tr>
<td>DC Body Current</td>
<td>10.0 mA</td>
<td>10.0 mA</td>
</tr>
<tr>
<td>RF Power Output</td>
<td>1.5 kW</td>
<td>1.4 kW</td>
</tr>
<tr>
<td>Bandwidth (3 dB)</td>
<td>13.0 MHz</td>
<td>19.0 MHz</td>
</tr>
<tr>
<td>Efficiency</td>
<td>36.0 %</td>
<td>33.0 %</td>
</tr>
<tr>
<td>Gain</td>
<td>42.0 dB</td>
<td>42.0 dB</td>
</tr>
<tr>
<td>Drive</td>
<td>100.0 mW</td>
<td>100.0 mW</td>
</tr>
<tr>
<td>Load VSWR</td>
<td>1.05:1</td>
<td>1.05:1</td>
</tr>
<tr>
<td>Input VSWR</td>
<td>1.3:1</td>
<td>1.3:1</td>
</tr>
</tbody>
</table>

General Information

Installation and Operation

No installation or operation should be attempted without first consulting the Installation and Operating Instructions shipped with each tube or available on request from Super Power Marketing, RCA, Lancaster, PA.

RCA reference publications required for the installation and operation of this device include the following:

- Data Sheet – RCA-8811
- Application Note AN 4213
- Application Guide 1CE-279A

These publications are available as a complete packet – request PWR 542 “Applications Information for the RCA-8811 klystron.”

Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals shielded.

Packaging

Two types of packaging are available with these tubes; Commercial Pack and Military Pack. The customer specifies the desired type.
The Commercial Pack is made of nesting cardboard cartons with the inner carton shock-mounted. The Military Pack complies with MIL-S-4473C for air shipment. It uses a hermetically-sealed metal container which protects the tube and serves to shield the area surrounding the pack from stray magnetic fields set up by the klystron focusing magnet.

In shipment, the tube is enclosed in a polyethylene bag to prevent dust and other particles from collecting in the waveguide or tuning system. It is recommended that the tube be stored in the bag and in the shipping container when not in use. Dust or other unwanted particles in the waveguide can cause arcing during operation and subsequent tube destruction.

Cooling

Air ducts must be provided to connect to the top of the collector and the tuner cooling duct. See Outline Drawing.

Mounting

Four holes are provided in the gun-end of the focusing magnet for mounting purposes. Only non-magnetic studs should be used.

Thermocouple

A thermocouple mounted on the collector provides a signal output for excessive collector temperature. This output is used to operate protective circuitry.

Tuning

Tuning is accomplished by a single knob which "gang-tunes" all four cavities simultaneously. The second, third and output cavities may be individually trimmed for optimizing the tube performance at any frequency within the tube operating band. See Outline Drawing.

Protection Circuits

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Guide 1CE-279A for complete information on protection circuits.
DIMENSIONAL OUTLINE
(Top View)

ENLARGED END VIEW OF SHAFTS

(4) SHAFTS

COLLECTOR GROUND CONNECTION

THERMOSTAT CONNECTION

(Bottom View)

(4) HOLES (NOTE 6)

RING TONGUE TERMINAL FOR NO 6 STUD

TUNER COVER

92 LL-3356

RCA
Electronic Components

DATA 3
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Specified Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inches</strong></td>
<td><strong>Millimeters</strong></td>
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<tr>
<td><strong>A</strong></td>
<td>15.5 max.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>4.06 ± .12</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>1.80 ± .12</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>3.5 max.</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>3.00 ± .06</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>3.80 ± .12</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>0.68 ± .05</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>1.80 ± .09</td>
</tr>
<tr>
<td><strong>J</strong></td>
<td>0.68 ± .10</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>6.25 max.</td>
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<tr>
<td><strong>L</strong></td>
<td>1.50 ± .03</td>
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<tr>
<td><strong>N Dia.</strong></td>
<td>4.12 ± .03</td>
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<tr>
<td><strong>P Dia.</strong></td>
<td>2.130 ± .015</td>
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<tr>
<td><strong>R</strong></td>
<td>10.5 max.</td>
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<tr>
<td><strong>S</strong></td>
<td>6.5 ± .5</td>
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<tr>
<td><strong>T Dia.</strong></td>
<td>0.250 ± .015</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>13.50 ± .25</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td>3.25 max.</td>
</tr>
<tr>
<td><strong>W</strong></td>
<td>5.00 ± .06</td>
</tr>
<tr>
<td><strong>X</strong></td>
<td>2.60 ± .06</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td>1.00 ± .06</td>
</tr>
<tr>
<td><strong>Z</strong></td>
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<td><strong>AA</strong></td>
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<tr>
<td><strong>AB</strong></td>
<td>2.10 ± .02</td>
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<tr>
<td><strong>AC</strong></td>
<td>0.201 ± .010</td>
</tr>
<tr>
<td><strong>AD</strong></td>
<td>1.00 ± .03</td>
</tr>
<tr>
<td><strong>AE</strong></td>
<td>2.00 ± .03</td>
</tr>
<tr>
<td><strong>AF</strong></td>
<td>3.25 ± .02</td>
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<tr>
<td><strong>AG</strong></td>
<td>3.75 ± .03</td>
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<tr>
<td><strong>AH</strong></td>
<td>0.25 ± .03</td>
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<tr>
<td><strong>AJ</strong></td>
<td>0.62 ± .03</td>
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<tr>
<td><strong>AK</strong></td>
<td>0.440 ± .010</td>
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<tr>
<td><strong>AL</strong></td>
<td>0.230 ± .005</td>
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<tr>
<td><strong>AM Dia.</strong></td>
<td>0.249 ± .002</td>
</tr>
<tr>
<td><strong>AN</strong></td>
<td>0.125 ± .030</td>
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<tr>
<td><strong>AP</strong></td>
<td>3.00 ± .06</td>
</tr>
<tr>
<td><strong>AR</strong></td>
<td>4.75 ± .12</td>
</tr>
</tbody>
</table>
Notes for Dimensional Outline

1. Mates with Type "N" Connector UG-21 B/U or equivalent.
2. Dimension applies to Shaft No.1 only.
3. Dimension applies to Shafts No.'s 2, 3, and 4 only.
4. Mates with UG-149 A/U or equivalent.
5. Holes 10-32 UNF-2B equally spaced on 3.250 ± .032 (82.6 ± .8 mm) dia. circle.
6. Holes 0.437 ± .062 (11.1 ± 1.6 mm) thru (One side only).
7. High-Voltage Lead Designation: Heater Lead — Yellow
   Heater-Cathode Lead — White
8. Thru-holes checked with gauge.
9. Three spaces between shafts are 0.70 ± .03 (17.8 ± .8 mm) and add to 2.100 (53.34 mm). Shafts are numbered as shown. (1) Gang tuner, (2) Cavity two, (3) Cavity three, (4) Output cavity.
10. Tolerance for this dimension applies to location of four 0.201 (5.11 mm) holes.
11. Hole No.6-32 UNC-2B, 0.25 (6.35 mm) minimum depth.

BANDWIDTH CHARACTERISTIC CURVE

The Beam Current Characteristic, Gain Characteristic, and Output Characteristic curves shown under Type 4658 also apply to Type 8811.
8824

CW Klystron Amplifier

- High Power Output
- Very High Gain
- Long Life, High Reliability
- Integral Cavity Construction
- Water/Vapor Cooled

Electromagnet Focusing

Electrical

- Frequency Range: 470-566 MHz
- Cathode Type: Indirectly heated, tungsten dispenser cathode

Heater (dc or 50-60 Hz):

- Voltage: $6.0 \pm 0.5 \text{ V}$
- Current @ 6.0 V, typical: 16.4 A
- Surge current, maximum: 30.0 A
- Warm-up time, minimum: 180 sec

Focusing: RCA-AJ2166 Electromagnet

Mechanical

- Mounting Position: Vertical, cathode down
- Dimensions, Maximum:
  - Height: (1485.9 mm) 58.5 in
  - Width: (381.0 mm) 15.0 in
- Weight, Approximate:
  - Uncrated: (90.7 kg) 200 lbs
  - Crated: (213.1 kg) 470 lbs

Inlet Coolant Connector: Mates with Hansen B2-H16
Outlet Coolant Connector: Mates with Hansen LL3-H21
Steam Outlet: See Dimensional Outline

Electrical Connections

- RF Input: UG-228/U jack mates with UG-21D/U plug
- RF Output: See Dimensional Outline
- Thermocouple:
  - Chromel: Pin H Cannon Rec.
  - Alumel: Pin J Cannon Rec.
  - Body: Pin E Cannon Rec.

Easy to Install and Operate
- Modulating Anode — permits both visual and aural application with a single beam supply

RCA Electronic Components

DATA 1
2-72
<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulating Anode</td>
<td>See Dimensional Outline</td>
</tr>
<tr>
<td>Heater-Cathode</td>
<td>See Dimensional Outline</td>
</tr>
<tr>
<td>Heater</td>
<td>See Dimensional Outline</td>
</tr>
<tr>
<td>Interlock #1</td>
<td>Pins A and B, Cannon Rec.</td>
</tr>
<tr>
<td>Interlock #2</td>
<td>Pins C and D, Cannon Rec.</td>
</tr>
</tbody>
</table>

**Thermal**

- Collector Temperature: 145 max. °C
- Body Temperature: 100 max. °C
- Electron Gun Insulator Temperature: 250 max. °C
- Storage Temperature: -65 min. °C

**Coolant Requirements**

- Collector and Body
  - Water flow: 7.5 l/m, 2.0 min. gpm
  - Inlet water temperature: 70 max. °C
- Electron Gun
  - Forced air flow: 24 l/s, 50 min. cfm
- Water Pressure Differential for
  - Typical Flow of 2.1 gpm: 3.5 kg/cm², 50 max. psi
  - Water Pressure at any Inlet: 4.2 kg/cm², 60 max. psi

**Maximum Ratings, Absolute-Maximum Values**

- Beam Voltage, DC: 20 max. kV
- Beam Current, DC: 5.5 max. A
- Body Current, DC: 250 max. mA
- Modulating Anode Voltage, DC: 20 max. kV
- Load VSWR: 1.5:1.0

**Typical Operation, UHF Television Service**
(Visual 471.25 MHz, Aural 475.75 MHz)

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Voltage, DC</td>
<td>0 0 V</td>
</tr>
<tr>
<td>Body Voltage, DC</td>
<td>0 0 V</td>
</tr>
<tr>
<td>Beam Current, DC</td>
<td>4.7 2.4 A</td>
</tr>
<tr>
<td>Body Current, DC</td>
<td>70 15 mA</td>
</tr>
</tbody>
</table>
### Modulating Anode Voltage, DC
- Voltage: 0 - 6 kV

### Modulating Anode Current, DC
- Current: 1.5 - 1.0 mA

### Cathode Voltage, DC
- Voltage: -18 kV

### Focusing Current, DC (Typical with RCA-AJ2166 Electromagnet)
- Current: 28 - 28 mA

### Load VSWR
- VSWR: 1.1:1

### Drive Power, for Visual Peak-of-Sync or Aural CW
- Power: 10.1 W

### Output, for Visual Peak-of-Sync or Aural CW
- Power: 31 - 12 kW

### Gain
- Gain: 35 - 40 dB

### Efficiency
- Efficiency: 37 - 28%

---

**General Information**

**Cooling**

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.

---

a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

b Pins F and G must always be used in parallel.

c Type CA22365-2729 Cannon Receptacle.

d All water must be removed from the water course during storage.

e Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.

f A DC ammeter make the connection between the collector and ground.

g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.
A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

**Electrical Connections to Tube Terminals**

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

**Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

**RF Output Coaxial Adapter**

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

**Installation and Operation**

RCA reference publications required for the installation and operation of this device include the following:

- Data Sheet — RCA-8824
- Application Note AN4206
- Application Guide 1CE-279A

These publications are available as a complete packet — request PWR-537, “Applications Information for the RCA-8824 Super-Power Klystron,”
Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

RCA AJ2166 Electromagnet

The RCA 8824 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2166. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

General Data

Voltage, DC .................. 125 max. V
Current, DC .................. 30 max. A
Dimensions .................. See Outline Drawing
Weight (approx.) ............... (158.7 kg) ............ 350 lbs

Cooling:

Water flow, minimum .......... (3.8 l/m) 1 gpm
Inlet temperature, maximum .... 70° C
Maximum water pressure differential for typical flow .......... (3.5 kg/cm²) 50 psig
Maximum water pressure at any inlet ................. (4.2 kg/cm²) 60 psig
Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.
ELECTROMAGNET DIMENSIONAL OUTLINE

FRONT VIEW

5/16 - 18
SHOULDER-TYPE
EYE-BOLTS

RF OUTPUT COAXIAL
ADAPTOR SLOT
"WIDTH" = 3.75 (95.2)
"DEPTH" = 5.25 (133.3)

0.38
(9.65)

31.437
± 0.062
(798.5)

1.57

26.65**
(676.9)

20.06**
(509.5)

12.31**
(312.6)

4.65**
(116.1)

1/4 - 20 TAP
2 HOLES

5/16 - 18 TAP
8 HOLES

3.00 ± 0.04
(76.2 ± 1.0)

4.50 ± 0.04
(114.3 ± 1.0)

2.25 ± 0.02
(56.35 ± 0.5)

92 LM - 3369

** LOCATION OF 1" DIAMETER TUNING PORTS

KLYSTRON DIMENSIONAL OUTLINE

TOP VIEW

CAVITY 2 LOADING (NOTE I)

CAVITY 1 LOADING
(NOTE I)

RF INPUT (NOTE I)

RF OUTPUT

CANNON RECEPTABLE
CA 22365 - 2729
(MATES WITH CANNON
PLUG 24 - 20)

Electronic
Components

DATA 4
2-72
## KLYSTRON OUTLINE DIMENSIONS

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50.83 ± 0.25</td>
<td>1290.0 ± 6.3</td>
</tr>
<tr>
<td>B</td>
<td>12.40 Max.</td>
<td>314.9 Max.</td>
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<td>C Dia.</td>
<td>0.75 Ref.</td>
<td>19.05</td>
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<tr>
<td>D Dia.</td>
<td>6.40 ± 0.04</td>
<td>162.56 ± 1.0</td>
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<tr>
<td>E</td>
<td>0.23 ± 0.04</td>
<td>5.84 ± 1.0</td>
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<tr>
<td>F</td>
<td>11.00 ± 0.12</td>
<td>279.4 ± 3.0</td>
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<tr>
<td>G</td>
<td>1.51 ± 0.01</td>
<td>38.35 ± 0.25</td>
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<tr>
<td>H</td>
<td>27.52 ± 0.06</td>
<td>699.0 ± 1.5</td>
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<td>J Dia.</td>
<td>7.50 Max.</td>
<td>190.5 Max.</td>
</tr>
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<td>K Dia.</td>
<td>5.00 ± 0.01</td>
<td>127.00 ± 0.25</td>
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<td>L</td>
<td>0.69 ± 0.05</td>
<td>17.53 ± 1.2</td>
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<tr>
<td>M Dia.</td>
<td>5.00 ± 0.03</td>
<td>127.00 ± 0.76</td>
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<tr>
<td>N</td>
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<td>4.82 ± 0.25</td>
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<tr>
<td>P</td>
<td>0.19 ± 0.01</td>
<td>4.82 ± 0.25</td>
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<tr>
<td>Q</td>
<td>0.04</td>
<td>1.0</td>
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<td>R</td>
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<td>S</td>
<td>6.89 ± 0.07</td>
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<td>T</td>
<td>4.16 ± 0.03</td>
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<td>V</td>
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<td>W</td>
<td>26.20 ± 0.06</td>
<td>665.5 ± 1.5</td>
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<td>X</td>
<td>30.82 ± 0.09</td>
<td>782.8 ± 2.2</td>
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<td>Y</td>
<td>0.50 ± 0.02</td>
<td>12.70 ± 0.5</td>
</tr>
<tr>
<td>Z Dia.</td>
<td>15.00 Max.</td>
<td>381.0 Max.</td>
</tr>
</tbody>
</table>

**Notes:**

1. UG-22 B/U jack mates with UG-21 D/U
2. Channel tuning screws 5/16” hex socket head.
3. Tube rollers mate with RCA AJ2166 electromagnet.
DETAIL RF OUTPUT CONNECTOR

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.
CW Klystron Amplifier

High Power Output
Very High Gain
Long Life, High Reliability
Integral Cavity Construction
Water/Vapor Cooled

Electromagnet Focusing

Electrical

Frequency Range: 566-696 MHz
Cathode Type: Indirectly heated, tungsten dispenser cathode
Heater (dc or 50-60 Hz):
   Voltage: 6.0 ± 0.5 V
   Current @ 6.0 V, typical: 16.4 A
   Surge current, maximum: 30.0 A
   Warm-up time, minimum: 180 sec

RCA-AJ2167 Electromagnet

Mechanical

Mounting Position: Vertical, cathode down
Dimensions, Maximum:
   Height: (1346 mm) 53 in
   Width (excluding output connector): (381.0 mm) 15.0 in

Weight, Approximate:
   Uncrated: (90.7 kg) 200 lbs
   Crated: (213.1 kg) 470 lbs

Inlet Coolant Connector: Mates with Hansen B2-H16
Outlet Coolant Connector: Mates with Hansen LL3-H21
Steam Outlet: See Dimensional Outline

Electrical Connections

RF Input: UG-228/U jack mates with UG-21D/U plug
RF Output: See Dimensional Outline
Thermocouple:
   Chromel: Pin H Cannon Rec.
   Alumel: Pin J Cannon Rec.
   Body: Pin E Cannon Rec.
Modulating Anode ......................... See Dimensional Outline
Heater-Cathode .......................... See Dimensional Outline
Heater .................................. See Dimensional Outline
Interlock #1 ............................. Pins A and B, Cannon Rec.©
Interlock #2 ............................. Pins C and D, Cannon Rec.©

Thermal
Collector Temperature .................... 145 max. °C
Body Temperature ........................ 100 max. °C
Electron Gun Insulator Temperature .... 250 max. °C
Storage Temperature ..................... -65 min. °C

Coolant Requirements
Collector and Body
Water flow ............................ (7.5 l/m) 2.0 min. gpm
Inlet water temperature .............. 70 max. °C
Electron Gun
Forced air flow ........................ (24 l/s) 50 min. cfm
Water Pressure Differential for
Typical Flow of 2.1 gpm ............... (3.5 kg/cm²) 50 max. psi
Water Pressure at any Inlet .......... (4.2 kg/cm²) 60 max. psi

Maximum Ratings, Absolute-Maximum Values
Beam Voltage, DC ...................... 20 max. kV
Beam Current, DC ..................... 5.5 max. A
Body Current, DC ...................... 250 max. mA
Modulating Anode Voltage, DC ...... 20 max. kV
Load VSWR ................................ 1.5:1.0

Typical Operation, UHF Television Service
(Visual 627.25 MHz, Aural 631.75 MHz)

| Collector Voltage, DC | 0 | 0 | V |
| Body Voltage, DC | 0 | 0 | V |
| Beam Current, DC | 4.7 | 2.4 | A |
| Body Current, DC | 70 | 15 | mA |

RCA Electronic Components
Modulating Anode Voltage, DC ........................................ 0  -6 kV
Modulating Anode Current, DC ........................................ 1.5  1.0 mA
Cathode Voltage, DC ................................................... -18  -18 kV
Focusing Current, DC (Typical with RCA-AJ2167 Electromagnet) ........................................ 28  28 A
Load VSWR .............................................................. 1.1:1  1.1:1 —
Drive Power, for Visual Peak-of-Sync or Aural CW .................. 10  1.1 W
Output, for Visual Peak-of-Sync or Aural CW .......................... 31  12 kW
Gain ................................................................. 36  40 dB
Efficiency ............................................................ 37  28 %

a Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.
b Pins F and G must always be used in parallel.
c Type CA22365-2729 Cannon Receptacle.
d All water must be removed from the water course during storage.
e Cooling air blower must be directed toward the electron gun and located within a distance of 24 inches.
f A DC ammeter make the connection between the collector and ground.
g The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

GENERAL INFORMATION

Cooling

The electron gun is cooled by forced-air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec) The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. Interlocking of the liquid flow through each of the cooled elements with the beam supply is recommended to prevent damage in case of cooling failure.
A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended. The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

**Electrical Connections to Tube Terminals**

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

**Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

**RF Output Coaxial Adapter**

The RF output coaxial adapter shown in the klystron Outline Drawing is shipped as a separate item within the tube crate. It must be screwed on after the tube is installed within the electromagnet.

**Installation and Operation**

RCA reference publications required for the installation and operation of this device include the following:

- Data Sheet - RCA-8825
- Application Note AN4206
- Application Guide 1CE-279A

These publications are available as a complete packet — request PWR-538, "Applications Information for the RCA-8825 Super-Power Klystron,"
Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded.

This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.

Packaging

The klystron is shipped in a specially designed shipping crate featuring steel tracks for receiving the rollers on the tube sides. Unpacking instructions are attached to the crate.

RCA AJ2167 Electromagnet

The RCA 8825 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2167. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

General Data

Voltage, DC ............................................. 125 max. V
Current, DC ............................................ 30 max. A
Dimensions ............................................. See Outline Drawing
Weight (approx.) ........................................ (158.7 kg) .................. 350 lbs

Cooling:

Water flow, minimum .............................. (3.8 l/m) 1 gpm
Inlet temperature, maximum ...................... 70° C
Maximum water pressure differential for typical flow ................. (3.5 kg/cm²) 50 psig
Maximum water pressure at any inlet ....................... (4.2 kg/cm²) 60 psig
Operating Considerations

Typical operating coil currents are noted under "Typical Operation" data section.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.

ELECTROMAGNET DIMENSIONAL OUTLINE
ELECTROMAGNET DIMENSIONAL OUTLINE

FRONT VIEW

RF OUTPUT COAXIAL ADAPTOR SLOT
"WIDTH" = 3.75 (95.2)
"DEPTH" = 5.25 (133.3)

5/16 - 18
SHOULDER-TYPE EYE-BOLTS

25.94 ± 0.06
(659 ± 2)

21.91
(556.5)

16.38
(416.1)

10.19
(258.8)

4.00
(101.6)

1/4 - 20 TAP
2 HOLES

5/16 - 18 TAP
8 HOLES

.25 ± 0.02
(6.35 ± .5)

1.50 ± 0.02
(38.1 ± .5)

9.66 ± 0.02
(246.2 ± 5)

14.06 ± 0.10
(357.1 ± 2.5)

LOCATION OF 1" DIAMETER TUNING PORTS

KLYSTRON DIMENSIONAL OUTLINE

TOP VIEW

RF INPUT (NOTE II)

CANNON RECEPTABLE
CA 22365 - 2729
(MATES WITH CANNON PLUG 24 - 20)
### KLYSTRON OUTLINE DIMENSIONS

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>45.77 ± 0.25</td>
<td>1162.6 ± 6.3</td>
</tr>
<tr>
<td>B</td>
<td>12.40 Max.</td>
<td>314.9 Max.</td>
</tr>
<tr>
<td>C Dia.</td>
<td>0.75 Ref.</td>
<td>19.05 Ref.</td>
</tr>
<tr>
<td>D Dia.</td>
<td>6.40 ± 0.04</td>
<td>162.6 ± 1.0</td>
</tr>
<tr>
<td>E</td>
<td>0.23 ± 0.04</td>
<td>5.8 ± 1.0</td>
</tr>
<tr>
<td>F</td>
<td>11.00 ± 0.12</td>
<td>279.4 ± 3.0</td>
</tr>
<tr>
<td>G</td>
<td>1.51 ± 0.01</td>
<td>38.35 ± 0.25</td>
</tr>
<tr>
<td>H</td>
<td>21.97 ± 0.06</td>
<td>558.0 ± 1.5</td>
</tr>
<tr>
<td>J Dia.</td>
<td>7.50 Max.</td>
<td>190.5 Max.</td>
</tr>
<tr>
<td>K Dia.</td>
<td>5.00 ± 0.01</td>
<td>127.00 ± 0.25</td>
</tr>
<tr>
<td>L</td>
<td>0.69 ± 0.05</td>
<td>17.53 ± 1.3</td>
</tr>
<tr>
<td>M Dia.</td>
<td>5.00 ± 0.03</td>
<td>127.00 ± 0.76</td>
</tr>
<tr>
<td>N</td>
<td>0.19 ± 0.01</td>
<td>4.82 ± 0.25</td>
</tr>
<tr>
<td>P</td>
<td>0.19 ± 0.01</td>
<td>4.82 ± 0.25</td>
</tr>
<tr>
<td>Q</td>
<td>0.04 Ref.</td>
<td>1.0 Ref.</td>
</tr>
<tr>
<td>R</td>
<td>2.79 ± 0.05</td>
<td>70.86 ± 1.3</td>
</tr>
<tr>
<td>S</td>
<td>6.89 ± 0.07</td>
<td>175.0 ± 1.7</td>
</tr>
<tr>
<td>T</td>
<td>3.45 ± 0.03</td>
<td>87.63 ± 0.76</td>
</tr>
<tr>
<td>U</td>
<td>9.65 ± 0.04</td>
<td>245.1 ± 1.0</td>
</tr>
<tr>
<td>V</td>
<td>15.85 ± 0.05</td>
<td>402.6 ± 1.3</td>
</tr>
<tr>
<td>W</td>
<td>21.37 ± 0.06</td>
<td>542.8 ± 1.5</td>
</tr>
<tr>
<td>X</td>
<td>25.26 ± 0.09</td>
<td>641.6 ± 2.2</td>
</tr>
<tr>
<td>Y</td>
<td>0.50 ± 0.02</td>
<td>12.70 ± 0.5</td>
</tr>
<tr>
<td>Z Dia.</td>
<td>15.00 Max.</td>
<td>381.0 Max.</td>
</tr>
</tbody>
</table>

**Notes:**

1. UG-22 B/U jack mates with UG-21 D/U
2. Channel tuning screws 5/16" hex socket head.
3. Tube rollers mate with RCA AJ2167 electromagnet.
DETAIL RF OUTPUT CONNECTOR

More complete information covering the handling, installation, safety and operation of this type may be obtained through an RCA Field Representative or by writing RCA Super Power Tube Marketing, Lancaster, PA. 17604.
UHF TV Klystron Amplifier

- Water/Vapor Cooled
- Electromagnet Focusing
- Easy to Install and Operate
- Modulating Anode – permits both visual and aural application with a single beam supply
- High Power Output
- Very High Gain
- Long Life, High Reliability
- Integral Cavity Construction

General Data

Electrical:
- Frequency Range: 698-890 MHz
- Cathode Type: Indirectly heated, tungsten-dispenser cathode
- Heater (dc or 50-60 Hz):
  - Voltage\(^a\): 6.0 ± 0.5 V
  - Current @ 6.0 V, typical: 16.4 A
  - Surge current, maximum: 30.0 A
  - Warm-up time, minimum: 180 sec
- Focusing: RCA-AJ2168 Electromagnet

Mechanical:
- Mounting Position: Vertical, cathode down
- Dimensions, Maximum:
  - Height: (1165 mm) 45.9 in
  - Width (excluding output connector): (330 mm) 13.0 in
- Weight, Approximate:
  - Uncrated: (81.6 kg) 180 lbs
  - Crated: (204 kg) 450 lbs
- Inlet Coolant Connector: Mates with Hansen LL3-H21
- Outlet Coolant Connector: Mates with Hansen LL6-H31
- Steam Outlet: See Dimensional Outline

Electrical Connections:
- RF Input: UG-22B/U jack mates with UG-21D/U plug
- RF Output: See Dimensional Outline
- Collector\(^b\): Pins F and G, Cannon Rec.\(^c\)
- Thermocouple:
  - Chromel: Pin H Cannon Rec.\(^c\)
  - Alumel: Pin J Cannon Rec.\(^c\)

RCA Electronic Components
Body ................................. Pin E Cannon Rec.c
Modulating Anode .................. See Dimensional Outline
Heater-Cathode ........................ See Dimensional Outline
Heater .................................. See Dimensional Outline
Interlock No.1 .................. Pins A and B, Cannon Rec.c
Interlock No.2 .................. Pins C and D, Cannon Rec.c

Thermal:
Collector Temp. (max.) ............. 145 °C
Body Temperature (max.) .......... 100 °C
Electron Gun Insulator Temp. (max.) .... 250 °C
Storage Temp.d (min.) ............. −65 °C

Coolant Requirements:
Collector and Body
Water flow (min.) ................... (0.125 l/s) 2.0 gpm
Inlet water temperature (max.) .... 70 °C

Electron Gun
Forced air flow e (min.) .......... (24 l/s) 50 cfm
Water Pressure Differential for
Typical Flow of 2.1 gpm (max.) ...

Water Pressure at any
Inlet (max.) ........................... 60 psi

Maximum Ratings, Absolute-Maximum Values
Beam Voltage, DC .................. 20 max. kV
Beam Current, DC .................. 5.5 max. A
Body Current, DC .................. 250 max. mA
Modulating Anode Voltage, DC .... 20 max. kV
Load VSWR .......................... 1.5:1.0

Typical Operation, UHF Television Service
(Visual 699.25 MHz, Aural 703.75 MHz)

<table>
<thead>
<tr>
<th>Visual</th>
<th>Aural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Voltage, DC f</td>
<td>0</td>
</tr>
<tr>
<td>Body Voltage, DC</td>
<td>0</td>
</tr>
<tr>
<td>Beam Current, DC</td>
<td>4.7</td>
</tr>
<tr>
<td>Body Current, DC g</td>
<td>70</td>
</tr>
<tr>
<td>Modulating Anode Voltage, DC</td>
<td>0</td>
</tr>
<tr>
<td>Modulating Anode Current, DC</td>
<td>1.5</td>
</tr>
<tr>
<td>Cathode Voltage, DC</td>
<td>−18</td>
</tr>
</tbody>
</table>

Electronics Components DATA 1
Focusing Current, DC (Typical With RCA-AJ2168 Electromagnet) ........................................ 28 28 A
Load VSWR .......................................................... 1.1:1 1.1:1
Drive Power for Visual Peak-of-Sync or Aural CW ................................................. 10 1.1 W
Output, for Visual Peak-of-Sync or Aural CW .......................................................... 31 12 kW
Gain ................................................................. 35 40 dB
Efficiency .......................................................... 37 28 %

- Careful attention to maintaining the minimum value of filament voltage consistent with adequate emission will result in conserving the life of the tube.

- Pins F and G must always be used in parallel.

- Type CA22365-2729 Cannon Receptacle.

- All water must be removed from the coolant course during storage and shipping.

- Cooling-air blower must be directed toward the electron gun and located within a distance of 24 inches.

- A dc ammeter makes the connection between the collector and ground.

- The body is connected directly to ground. Body current is measured in the ground leg of the beam power supply.

**Operating Considerations**

Typical operating coil currents are noted under "Typical Operation" data section in this data sheet.

It is recommended that the coil coolant flow start before the application of any coil voltage and preferably continue for five minutes after the removal of voltages. Interlocking of the coolant flow with the klystron beam and modulating-anode voltages and coil voltages is highly recommended to prevent tube and coil damage in the event of inadequate coolant flow.

The use of a solid-state diode connected in parallel with the electromagnet is recommended to prevent excessive transient voltage build-up in the event of coil current interruptions. Connections should be made so the coil current will flow through the diode when the polarity of the normal coil voltage becomes reversed.
Dimensional Outline - Klystron

RCA Electronic Components
**Pin Connections — Voltage Socket**

- **A**: Jumpered
- **B**: Jumpered
- **C**: Jumpered
- **D**: Jumpered
- **E**: Body (Ground)
- **F**: Collector*
- **G**: Collector*
- **H**: Thermocouple (Chromel)
- **J**: Thermocouple (Alumel)

*Always use pins F and G in parallel.*

**Tabulated Dimensions for Klystron**

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Value — Inches</th>
<th>Value — Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>45.56 ± .32</td>
<td>1157 ± 8</td>
</tr>
<tr>
<td>B</td>
<td>16.33 ± .06</td>
<td>414.8 ± 1.5</td>
</tr>
<tr>
<td>C</td>
<td>1.50 ± .01</td>
<td>38.10 ± .25</td>
</tr>
<tr>
<td>D</td>
<td>13.00 Max.</td>
<td>330.2 Max.</td>
</tr>
<tr>
<td>E</td>
<td>11.00 ± .12</td>
<td>279.4 ± 3.0</td>
</tr>
<tr>
<td>F</td>
<td>0.23 ± .04</td>
<td>5.8 ± 1.0</td>
</tr>
<tr>
<td>G</td>
<td>12.40 Max.</td>
<td>315.0 Max.</td>
</tr>
<tr>
<td>H</td>
<td>6.40 ± .04</td>
<td>162.6 ± 1.0</td>
</tr>
<tr>
<td>J</td>
<td>0.50 ± .02</td>
<td>12.70 ± .51</td>
</tr>
<tr>
<td>K</td>
<td>38.67 ± .25</td>
<td>982.2 ± 6.4</td>
</tr>
<tr>
<td>M</td>
<td>18.66 ± .08</td>
<td>474.0 ± 2.0</td>
</tr>
<tr>
<td>N</td>
<td>15.74 ± .06</td>
<td>399.8 ± 1.5</td>
</tr>
<tr>
<td>P</td>
<td>11.50 ± .05</td>
<td>292.1 ± 1.3</td>
</tr>
<tr>
<td>R</td>
<td>7.15 ± .04</td>
<td>181.6 ± 1.0</td>
</tr>
<tr>
<td>S</td>
<td>2.82 ± .03</td>
<td>72.4 ± .8</td>
</tr>
<tr>
<td>T</td>
<td>5.76 Max.</td>
<td>14.63 Max.</td>
</tr>
<tr>
<td>U</td>
<td>0.04 Ref.</td>
<td>1.0 Ref.</td>
</tr>
<tr>
<td>V</td>
<td>5.00 ± .01</td>
<td>127.00 ± .25</td>
</tr>
<tr>
<td>W</td>
<td>0.19 ± .01</td>
<td>4.83 ± .25</td>
</tr>
<tr>
<td>X</td>
<td>6.89 ± .07</td>
<td>175.0 ± 1.8</td>
</tr>
<tr>
<td>Y</td>
<td>0.69 ± .05</td>
<td>17.5 ± 1.3</td>
</tr>
<tr>
<td>Z</td>
<td>5.00 ± .03</td>
<td>127.0 ± .8</td>
</tr>
</tbody>
</table>

**Notes:**

1. RF Input Jack, UG-22 B/U mates with UG-21 D/U.
2. Channel tuning screws. These screws have a 5/16 inch hex socket head.
3. Tube rollers mate with roller guides in the RCA AJ2168 Electromagnet.
4. Inlet Water Connector mates with Hansen LL3-H21 Connector.
5. Reference Surface corresponds with electromagnet reference surface when installed.
Personnel Safety

The high voltages and microwave radiations from this device can be dangerous to life. High voltage shielding and interlock precautions must be taken and all rf connections must be tightly closed and rf terminals adequately shielded. This device, in operation, may produce X-radiation which can constitute a health hazard. Shielding or other precautions may be required.
Tabulated Dimensions for Electromagnet

<table>
<thead>
<tr>
<th>Dim.</th>
<th>Value - Inches</th>
<th>Value - Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.87 ± .03</td>
<td>72.9 ± .8</td>
</tr>
<tr>
<td>B</td>
<td>7.25 ± .03</td>
<td>184.2 ± .8</td>
</tr>
<tr>
<td>C</td>
<td>11.60 ± .03</td>
<td>294.6 ± .8</td>
</tr>
<tr>
<td>D</td>
<td>15.79 ± .03</td>
<td>401.1 ± .8</td>
</tr>
<tr>
<td>E</td>
<td>0.50 ± .02</td>
<td>12.7 ± .5</td>
</tr>
<tr>
<td>F</td>
<td>19.28 ± .05</td>
<td>489.7 ± 1.3</td>
</tr>
<tr>
<td>G</td>
<td>1.76 ± .06</td>
<td>44.7 ± 1.5</td>
</tr>
<tr>
<td>H</td>
<td>10.00 ± .03</td>
<td>254.0 ± .8</td>
</tr>
<tr>
<td>J</td>
<td>12.79 ± .03</td>
<td>324.9 ± .8</td>
</tr>
<tr>
<td>K</td>
<td>3.16 ± .06</td>
<td>80.3 ± 1.5</td>
</tr>
<tr>
<td>L</td>
<td>4.00 ± .03</td>
<td>101.6 ± .8</td>
</tr>
<tr>
<td>M</td>
<td>4.50 ± .03</td>
<td>114.3 ± .8</td>
</tr>
<tr>
<td>N</td>
<td>3.00 ± .03</td>
<td>76.2 ± .8</td>
</tr>
<tr>
<td>P</td>
<td>7.00 ± .03</td>
<td>177.8 ± .8</td>
</tr>
<tr>
<td>R</td>
<td>16.00 ± .03</td>
<td>406.4 ± .8</td>
</tr>
<tr>
<td>S</td>
<td>17.00 Max.</td>
<td>431.8 Max.</td>
</tr>
<tr>
<td>T</td>
<td>1.00 ± .03</td>
<td>25.4 ± .8</td>
</tr>
<tr>
<td>V</td>
<td>5.60 ± .03</td>
<td>142.2 ± .8</td>
</tr>
<tr>
<td>W</td>
<td>12.80 ± .05</td>
<td>325.1 ± 1.3</td>
</tr>
<tr>
<td>X</td>
<td>10.68 ± .06</td>
<td>271.3 ± 1.3</td>
</tr>
</tbody>
</table>

General Information

Cooling

The electron gun is cooled by forced air directed at the cathode-seal area. Air flow must be at least 50 cfm. (24.0 l/sec). The remainder of the tube is cooled by water/vapor system with water cooling the resonators and drift-tube sections and vapor cooling the collector.

The use of distilled water is essential. The liquid flow must start before application of any voltages and preferably should continue for five minutes after removal of voltages. It is recommended that the liquid flow through each of the cooled elements be interlocked with the beam supply to prevent damage to the tube in case of cooling failure.

A steam exhaust sleeve must be provided for the top of the klystron boiler. A flexible, neoprene type is recommended.
The sleeve is placed over the lip provided at the top of the boiler (see Dimensional Outline) and clamped securely in place for a water-tight connection.

**Electrical Connections to Tube Terminals**

Connections to the Heater, Heater-Cathode and Modulating Anode Terminals (see Dimensional Outline) are made with preformed finger stock or knife blade type fuse clips. Care should be taken when making these connections not to place excessive stress on the ceramic-to-metal seals.

**Protection Circuits**

Protection circuits serve a threefold purpose: safety of personnel, protection of the tube and protection of tube circuits. Consult Application Note AN4206 for complete information on protection circuits required.

A means of protecting the klystron against damage which would result from failure of the collector vapor cooling system is provided by an integral chromel-alumel thermocouple with terminals at the Cannon Receptacle.

**RCA AJ2168 Electromagnet**

The RCA 8826 klystron is designed to be mounted in and its beam focused by the water-cooled, single-coil electromagnet, RCA-AJ2168. The exposed surfaces of the electromagnet are treated by painting or plating to resist corrosion.

**General Data**

- Voltage, DC (max.): 35 V
- Current, DC (max.): 30 A
- Dimensions: See Dimensional Outline
- Weight (Approx.): Uncrated (104 kg) 230 lbs, Crated (145 kg) 320 lbs

**Cooling:**

- Water flow, minimum: (0.063 l/s) 1 gpm
- Inlet temperature, maximum: 70° C
- Maximum water pressure differential for typical flow (gauge): (3.5 kg/cm²) 50 psi
- Maximum water pressure at any inlet (gauge): (4.2 kg/cm²) 60 psi
Beam Power Tube

Full Ratings to 500 MHz
80 Watts PEP Output at 30 MHz

ELECTRICAL

Heater, for Unipotential Cathode:

Voltage (AC or DC)\(^a\) ........................................... 26.5  V
Current at 26.5 volts ........................................... 0.68  A
Minimum heating time .......................................... 120  s
Mu-Factor, (Grid No.2 to Grid No.1)\(^b\) ...................... 12

Direct Interelectrode Capacitances:\(^c\)

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to plate</td>
<td>0.15 max.  pF</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>16  pF</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>0.010  pF</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>23  pF</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>7.2  pF</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>2.7  pF</td>
</tr>
<tr>
<td>Cathode to heater</td>
<td>3.3  pF</td>
</tr>
<tr>
<td>Mounting flange to plate</td>
<td>3.0  pF</td>
</tr>
</tbody>
</table>

MECHANICAL

Operating Position ........................................... Any
Maximum Overall Length .................................... (56.9 mm)  2.24 in
Seated Length ................................................ (49.8 mm)  1.96 in
Greatest Radius ............................................. (35.1 mm)  1.38 in

Base-Large Wafer Elevenar 11-Pin with Ring. ............... (JEDEC No.E11-81)

Socket\(^d\) .................................................. { \begin{align*} & \text{Erie 9802-000, Erie 9804-000} \\ & \text{Johnson 124-311-100 or equivalent} \end{align*} }

Grid No.2 By-pass Capacitor .................. \begin{align*} & \text{Erie 2943-002, Johnson 124-121} \\ & \text{or equivalent} \end{align*}

Weight (Approx.) ........................................... (170.1 gr)  6 oz

THERMAL

Terminal Temperature\(^e\) .................................... 250 max.  °C
Radiator Core Temperature\(^e\) ............................. 250 max.  °C
Mounting Flange Temperature\(^e\) ......................... 125 max.  °C

\(^a\) Voltage can be varied from 24 to 28 V.
\(^b\) Grid No.2 to Grid No.1 at 2.737 MHz.
\(^c\) Capacitance values are for +26.5 volt anode and 120 second heating time.
\(^d\) See JEDEC Standard No.70.
\(^e\) Temperature limits are not to exceed the limiting temperature of any component in the circuit.

RCA Electronic Components
LINEAR RF POWER AMPLIFIER
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:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>450 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>200 max. W</td>
</tr>
<tr>
<td>Grid No.2 Dissipation</td>
<td>8 max. W</td>
</tr>
</tbody>
</table>

Peak Heater-Cathode Voltage:
- Heater negative with respect to cathode: 150 max. V
- Heater positive with respect to cathode: 150 max. V

TYPICAL CCS OPERATION WITH "TWO-TONE MODULATION":

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-20 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>1420 Ω</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>205 mA</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>150 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current at Peak of Envelope</td>
<td>16 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>10 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.1 Current</td>
<td>1.0 mA</td>
</tr>
<tr>
<td>Peak-Envelope Driver Power</td>
<td>0.3 W</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>95 %</td>
</tr>
<tr>
<td>Distortion Products Level</td>
<td></td>
</tr>
<tr>
<td>Third order</td>
<td>30 dB</td>
</tr>
<tr>
<td>Fifth order</td>
<td>35 dB</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>40 W</td>
</tr>
<tr>
<td>Peak envelope</td>
<td>80 W</td>
</tr>
</tbody>
</table>
MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance

Under Any Condition:

With fixed bias ........................................... 26000 max. \( \Omega \)
With fixed bias (in Class AB\(_1\) operation) .................. 100000 max. \( \Omega \)
With cathode bias ........................................ Not recommended

Grid-No.2 Circuit Impedance .................. 10000 \( \Omega \)
Plate Circuit Impedance .............................. See Note j

PLATE-MODULATED RF POWER AMPLIFIER\(^f\)
CLASS C TELEPHONY
Carrier conditions per tube for use with a max. modulation factor of 1.0.

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1800 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>250 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>5 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>150 max. W</td>
</tr>
</tbody>
</table>

TYPICAL CCS OPERATION
In grid-drive circuit at 50 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500 700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage(^f)</td>
<td>150 150 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage(^u)</td>
<td>-20 -25 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>200 250 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>36 40 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>20 35 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)(^v)</td>
<td>1.2 2 W</td>
</tr>
<tr>
<td>Output Circuit Efficiency (Approx.) (^\Delta)</td>
<td>90 90 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>50 100 W</td>
</tr>
</tbody>
</table>

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance

Under Any Condition:

With fixed bias ........................................... 26000 max. \( \Omega \)
Grid-No.2 Circuit Impedance .............................. 100000 max. \( \Omega \)
Plate Circuit Impedance .............................. See Note j

---

\(^f\) Plate-modulated RF power amplifier
\(^u\) Upper limit of Plate DC voltage
\(^v\) Output circuit efficiency
\(^\Delta\) Useful power output

RCA Electronic Components

DATA 2 5-70
RF POWER AMP. AND OSCILLATOR*, CLASS C TELEGRAPHY
RF POWER AMPLIFIER† AND CLASS C FM TELEPHONY

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Up to 500 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>2200 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-100 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 max. mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>200 max. W</td>
</tr>
</tbody>
</table>

Peak Heater-Cathode Voltage:
- Heater negative with respect to cathode: 150 max. V
- Heater positive with respect to cathode: 150 max. V

TYPICAL CCS OPERATION

In Grid-Drive Circuit at 50 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>500 - 700 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>160 - 175 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10 - 10 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>300 - 300 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>25 - 25 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>50 - 50 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1.2 - 1.2 W</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>75 - 100 W</td>
</tr>
</tbody>
</table>

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance
Under Any Condition:
- With Fixed bias: 25,000 max. Ω

Grid-No.2 Circuit Impedance: 10,000 max. Ω
Plate Circuit Impedance: See Note j
### CHARACTERISTICS RANGE VALUES

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>0.62</td>
</tr>
</tbody>
</table>

#### Direct Interelectrode Capacitances:

- Grid-No.1 to plate: 2 | 0.15 | pF
- Grid-No.1 to cathode: 2 | 14.6 | 18.0 | pF
- Plate to cathode: 2 | 0.004 | 0.016 | pF
- Grid-No.1 to grid No.2: 2 | 20.0 | 26.5 | pF
- Grid-No.2 to plate: 2 | 6.5 | 7.9 | pF
- Grid-No.2 to cathode: 2 | 2.1 | 3.3 | pF
- Cathode to heater: 2 | 2.5 | 4.1 | pF

- Grid-No.1 Voltage: 1,3 | -8 | -19 | V
- Grid-No.2 Current: 1,3 | -6 | +6 | mA

#### Interelectrode Leakage Resistance:

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>50</td>
<td>MΩ</td>
</tr>
</tbody>
</table>

#### Cutoff Grid-No.1 Voltage:

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,5</td>
<td>-47</td>
<td>V</td>
</tr>
</tbody>
</table>

**Note 1:** With 26.5 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With dc plate voltage of 700 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage adjusted to give a dc plate current of 185 ma.

**Note 4:** Under conditions with tube at 20° to 30° C for at least 30 minutes without any voltages applied to the tube. The resistance between any two electrodes is measured with a 200-volt Megger-type ohmmeter, or equivalent, having an internal impedance of 1.0 meg-ohm.

**Note 5:** With dc plate voltage of 2000 volts, dc grid-No.2 voltage of 250 volts, and dc grid-No.1 voltage varied to obtain a plate current of 5 ma.

- For plate volts = 450 V, Grid No.2 volts = 325 V
- Plate Current = 1.2 A

**d** Measured with special shield adapter.

**d** These items may be obtained from:

- Erie Technological Products Inc., 644 West Twelfth Street, Erie, PA 16512
- E. F. Johnson Company, 299 Tenth Avenue S. W., Waseca, MN 56093

- See Dimensional Outline for Temperature Measurement Points.
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 300 mA. During short periods of circuit adjustment under "Single-Tone" conditions, the average plate current may be as high as 450 mA.

Maximum plate dissipation is limited by the maximum mounting flange temperature and the cooling system to maintain tube operation below the specified maximum mounting flange temperature.

This value represents the approximate grid-No.1 current obtained due to initial electron velocities and contact-potential effects when grid No.1 is driven to zero volts at maximum signal.

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.

Referenced to either of the two tones and without the use of feedback to enhance linearity.

This value of useful power is measured at the load of the output circuit.

Obtained preferably from a separate source modulated along with the plate supply.

Obtained from the Grid-No.1 resistor or from a combination of Grid-No.1 resistor with either a fixed supply or cathode resistor.

Driver power output included circuit losses and is the actual power measured at the input to the grid circuit. It will vary depending upon the frequency of operation and the circuit used.

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

a—See ELECTRICAL CONSIDERATIONS - Filament or Heater.

f—See CLASSES OF SERVICE - RF Power Amplifiers or Oscillators.

j—See ELECTRICAL CONSIDERATIONS - Plate Voltage Supply.

k—See ELECTRICAL CONSIDERATIONS - Grid-No. 2 Voltage Supply.

m—See ELECTRICAL CONSIDERATIONS - Grid-No. 1 Voltage Supply.
DIMENSIONAL OUTLINE

**NOTE 1**

**NOTE 2**

**NOTE 3**

**NOTE 4**

**NOTE 5**

**NOTE 6**

**GRID - No. 2 TERMINAL CONTACT SURFACE (RING)**

**BERYLLIA HEAT SINK COUPLER (NOTE 3 & 4)**

**MOUNTING FLANGE**

**ANODE CORE TEMPERATURE MEASUREMENT POINT**

**CERAMIC**

**KEEP CLEAR**

Electronic Components
# OUTLINE DIMENSIONS

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Millimeters</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.000 max.</td>
<td>50.80 max.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1.960 max.</td>
<td>49.78 max.</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1.515 ± .030</td>
<td>38.48 ± .76</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.700 ± .020</td>
<td>17.78 ± .51</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.350 ± .010</td>
<td>8.89 ± .25</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1.375 ref.</td>
<td>34.93 ref.</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1.750 ± .020</td>
<td>44.45 ± .51</td>
<td>90° ± 10°</td>
</tr>
<tr>
<td>H</td>
<td>1.375</td>
<td>34.93</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>0.875</td>
<td>22.23</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>0.688</td>
<td>17.48</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>1.187 ± .015</td>
<td>30.15 ± .38</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.593 ± .005</td>
<td>15.06 ± .13</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>0.593 ± .005</td>
<td>15.06 ± .13</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.150 min.</td>
<td>3.81 min.</td>
<td>90°</td>
</tr>
<tr>
<td>R</td>
<td>0.300 ± .020</td>
<td>7.62 ± .51</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>0.255</td>
<td>6.48</td>
<td>.64</td>
</tr>
<tr>
<td>T</td>
<td>-.015</td>
<td>-.38</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>+.005</td>
<td>14.43</td>
<td>+.13</td>
</tr>
<tr>
<td></td>
<td>-.009</td>
<td>-.23</td>
<td></td>
</tr>
</tbody>
</table>

## DIMENSIONAL OUTLINE NOTES

**Note 1:** Flat location in relation to pin 6 of JEDEC Base E11-81.

**Note 2:** Tapped holes (2) 6-32 for conduction cooling system.

**Note 3:** CAUTION! Heat sink ceramic consists of beryllium oxide. Inhalation of beryllium oxide dust can be hazardous. Disposal precaution required.


**Note 5:** Keep all stippled regions clear. Do not allow contact or circuit components to intrude into this annular volume.

**Note 6:** In order to accommodate the eccentricities of the tube base with respect to the anode, and the variations in manufacturing tolerances of the conduction cooling assembly it is recommended that the holes for socket mounting be made larger than that required for screw clearance. Thus the tube may be mounted to the heat sink without placing undue strain on the tube base pins. An increase in socket mounting hole size of .030 inch should be adequate in most instances.
TERMINAL DIAGRAM

(Bottom View)

Pin 1: Cathode
Pin 2: Grid No.2
Pin 3: Grid No.1
Pin 4: Cathode
Pin 5: Heater
Pin 6: Heater
Pin 7: Grid No.2
Pin 8: Grid No.1
Pin 9: Cathode  Cap: Plate Terminal
Pin 10: Grid No.2  Ring: Grid-No.2 Terminal Contact Surface
Pin 11: Grid No.1  (For use at higher frequencies)

Base conforms to specification of JEDEC No.E11-81
Large Wafer Elevenar Base Eleven Pin with Ring and can be checked with gauge JEDEC No.GE11-1

CONSTANT-CURRENT CHARACTERISTICS

HEATER VOLTAGE ($E_h$) = 26.5 V
GRID No.2 VOLTAGE ($E_{c2}$) = 400 V
PLATE CURRENT $I_p$
GRID No.2 CURRENT $I_{c2}$
GRID No.1 CURRENT $I_{c1}$
CONSTANT-CURRENT CHARACTERISTICS

HEATER VOLTAGE \( (E_t) = 26.5 \) V
GRID No. 2 VOLTAGE \( (E_{c2}) = 250 \) V
PLATE CURRENT \( I_b \)
GRID No. 2 CURRENT \( I_{c2} \)
GRID No. 1 CURRENT \( I_{c1} \)

GRID No. 1 VOLTAGE — VOLTS

GRID No. 2 VOLTAGE \( (E_{c2}) = 150 \) V
PLATE CURRENT \( I_b \)
GRID No. 2 CURRENT \( I_{c2} \)
GRID No. 1 CURRENT \( I_{c1} \)

PLATE VOLTAGE — VOLTS

RCA Electronic Components DATA 5
**S-Band High Power Klystron**

- Pulse Amplifier Service
- Factory Fixed Tuned
- Water Cooled
- 28 Megawatts Peak Pulse Output at 2856 MHz
- Power Gain - 53 dB

### General Data

#### Electrical:

**Heater**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Matrix Type, Oxide Coated, Unipotential Cathode</td>
</tr>
<tr>
<td>Voltage (AC or DC)</td>
<td>17 V</td>
</tr>
<tr>
<td>Current (at 17 V)</td>
<td>15.5 A</td>
</tr>
<tr>
<td>Warm up time (at 15.5 A)</td>
<td>20 min.</td>
</tr>
</tbody>
</table>

**Direct Interelectrode Capacitance**

- Anode to cathode: 42 pF
- Anode to cathode with corona shield and in electromagnet: 50 pF

**Operating Frequency**

- 2856 MHz

#### Mechanical:

**Operating Attitude**

- Vertical, Heater-Cathode end down

**Coolant Connection Pair**

- Inlet water connection: 1/2-14 NPT External*
- Outlet water connection: 1/2-14 NPT External*

**Electrical Connections**

- Beam voltage, heater and heater-cathode connections: See Dimensional Outline
- RF input: Mates with Male Connector UG-573/U
- RF output: Mates with Male Waveguide Flange AJ2121, to WR 284 Waveguide

#### Uncrated Weight (Approx.)

- Klystron: (68 kg) 150 lb
- Electromagnet: (305 kg) 670 lb
- X-radiation shielding: (127 kg) 280 lb

**Total Weight, Installed with Electro-Magnet and X-Radiation Shielding**: (500 kg) 1100 lb

---

*See Dimensional Outline*
Thermal:
(See Dimensional Outline for temperature measurement points)

Metal Surface Temperature
- At O-ring on cathode cylinder .............. 100 max. °C
- At all other metal surfaces .................. 150 max. °C

Ambient Oil Temperature
- (Electron-gun-assembly bath) ............... 100 max. °C

Window Band Temp. through 10-32 NF
- Tapped Hole in Window Cover to Accommodate Thermocouple .......... 90 max. °C

Cooling
- Immersion of the electron-gun assembly in the oil-bath is required, to the level indicated on the Dimensional Outline. Transformer oil with high insulating properties such as GE 10 C (Mfg. by GE Company) or equivalent, must be used. The oil-bath must be of sufficient volume to limit the surface of the electron gun assembly to a maximum temperature of 100° C.

Water Cooling of the Internal Structure is Required
- Water flow .................. 13 typ. gal/min.
- Maximum water pressure at inlet ......... 100 max. psi
- Maximum pressure differential ............ 30 max. psi
- Outlet water temperature ................. 70 max. °C
- Resistivity of coolant water ............... 1.0 min. meghom-cm

Pulsed RF Amplifier Ratings

Maximum Ratings, Absolute-Maximum Values:
- For a maximum dc rectangular pulse "ON" time of 3.2 microseconds in any 2700-microsecond interval, and a rf load vacuum of 10⁻¹ Torr.

Peak Pulsed DC Beam Voltage ............... 270 max. kV
Peak Inverse Beam Voltage ................. 55 max. kV
Peak Pulsed DC Beam Current .............. 298 max. A
Peak Pulsed Input Beam Power ............. 80 max. MW
Average Input Beam Power ................. 94 max. kW
Load VSWR (Maximum) ...................... 1.5:1

Typical Operation:
- With rectangular waveshape rf-pulse having a duty factor of 0.0009 and a duration of 2.5 microseconds centered within a dc pulse duration of 3.2 microseconds, and at a frequency of 2856 MHz.

Peak Pulsed DC Beam Voltage ............... 270 250 225 kV
Peak Pulsed DC Beam Current .............. 280 250 213 A
### Driving Power Input at Peak of Pulse (Input VSWR < 1.5:1)...

|          | 120 | 145 | 170 | W |

### Useful Power Output at Peak of Pulse (Load VSWR < 1.2:1)...

|          | 28  | 23  | 16  | MW |

### Power Gain

|          | 53  | 52  | 48  | dB |

### Phase Modulation, by Heater Magnetic Field

|          | 0.14 | 0.12 | 0.10 | deg |

### Phase Modulation, by Change in Beam Voltage

|          | 6.0  | 6.0  | 6.0  | deg/percent |

### Amplitude Modulation, by Noise and Heater Magnetic Field

|          | 0.12 | 0.10 | 0.08 | percent |

Accessories necessary for rated operation of the 8840 are available from RCA and include X-radiation shields, electromagnets for beam focusing, a sputter-ion-pump magnet assembly, a corona shield, an "O" ring and a mating waveguide flange with its associated gasket and hardware.

<table>
<thead>
<tr>
<th>Description</th>
<th>RCA Type No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set of X-Radiation Shields</td>
<td>AJ2171</td>
</tr>
<tr>
<td>Upper Collector Shield</td>
<td>AJ2107</td>
</tr>
<tr>
<td>Lower Collector Shield</td>
<td>AJ2173</td>
</tr>
<tr>
<td>Outlet Water Pipe Shield</td>
<td>AJ2109</td>
</tr>
<tr>
<td>Window Shield</td>
<td>AJ2110</td>
</tr>
<tr>
<td>Waveguide Shield</td>
<td>AJ2111</td>
</tr>
<tr>
<td>Inlet Water Pipe Shield</td>
<td>AJ2112</td>
</tr>
<tr>
<td>Aluminum Spool Shield</td>
<td>AJ2113</td>
</tr>
<tr>
<td>Focusing Magnet (One required)</td>
<td></td>
</tr>
<tr>
<td>Electromagnet, Multi Coil</td>
<td>AJ2117V2</td>
</tr>
<tr>
<td>Electromagnet Single Coil</td>
<td>AJ2117V3</td>
</tr>
<tr>
<td>Corona Shield</td>
<td>AJ2115</td>
</tr>
<tr>
<td>Sputter Ion Pump Magnet &amp; Bracket</td>
<td>AJ2170</td>
</tr>
<tr>
<td>Oil Tank Sealant O-Ring</td>
<td>AJ2122</td>
</tr>
<tr>
<td>Male Waveguide Flange</td>
<td>AJ2121</td>
</tr>
<tr>
<td>Waveguide Flange Hardware (Ten sets, bolts, nuts, washers)</td>
<td>AJ2123</td>
</tr>
<tr>
<td>Waveguide Flange Gasket (One required)</td>
<td></td>
</tr>
<tr>
<td>Aluminum Gasket</td>
<td>AJ2119</td>
</tr>
<tr>
<td>Copper Gasket</td>
<td>AJ2120</td>
</tr>
</tbody>
</table>

* Amer. Std. Pipe Thd. (Tapered)
### Tabulated Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>57.6 max.</td>
<td>1463 max.</td>
</tr>
<tr>
<td>B</td>
<td>22.9 ± 0.3</td>
<td>582 ± 8</td>
</tr>
<tr>
<td>C</td>
<td>2.66 ± 0.12</td>
<td>67.6 ± 3.0</td>
</tr>
<tr>
<td>D</td>
<td>30.2 ± 0.2</td>
<td>767 ± 5</td>
</tr>
<tr>
<td>E</td>
<td>26.03 ± 0.09</td>
<td>661.2 ± 2.3</td>
</tr>
<tr>
<td>F</td>
<td>24.00 ± 0.03</td>
<td>609.6 ± 0.8</td>
</tr>
<tr>
<td>G Dia.</td>
<td>13.00 ± 0.15</td>
<td>330.2 ± 3.8</td>
</tr>
<tr>
<td>H Dia.</td>
<td>7.84 ref.</td>
<td>199.1 ref.</td>
</tr>
<tr>
<td>J</td>
<td>9.3 ± 1.0</td>
<td>236 ± 25</td>
</tr>
<tr>
<td>K</td>
<td>1.26 ± 0.06</td>
<td>32.0 ± 1.3</td>
</tr>
<tr>
<td>L</td>
<td>13.0 max.</td>
<td>330 max.</td>
</tr>
<tr>
<td>M</td>
<td>10.50 ref.</td>
<td>266.7 ref.</td>
</tr>
<tr>
<td>N</td>
<td>5.44 ref.</td>
<td>138.2 ref.</td>
</tr>
<tr>
<td>P</td>
<td>7.50 ± 0.03</td>
<td>190.5 ± 0.8</td>
</tr>
<tr>
<td>Q</td>
<td>12.5 max.</td>
<td>317 max.</td>
</tr>
<tr>
<td>R Dia.</td>
<td>14.2 max.</td>
<td>361 max.</td>
</tr>
<tr>
<td>S</td>
<td>8.53 ± 0.35</td>
<td>216.7 ± 8.9</td>
</tr>
<tr>
<td>T</td>
<td>45° ref.</td>
<td>45° ref.</td>
</tr>
<tr>
<td>V Dia.</td>
<td>1.12 ref.</td>
<td>28.5 ref.</td>
</tr>
<tr>
<td>W Dia.</td>
<td>1.92 ± 0.03</td>
<td>48.8 ± 0.8</td>
</tr>
<tr>
<td>X</td>
<td>0.06 min.</td>
<td>1.3 min.</td>
</tr>
<tr>
<td>Y</td>
<td>0.67 ± 0.16</td>
<td>17.0 ± 4.1</td>
</tr>
</tbody>
</table>

### Notes

1. Recommended diameter of O-ring sealing surface.
3. Mounting holes, six, 9/16 inch diameter equally spaced on a 11.56 in diameter circle.
4. Holes for lifting eye bolts tapped 1/2-13 NC equally spaced on a 10.0 inch diameter circle.
5. A vacuum pump control unit 921-0062 (Varian Vacuum Div., Palo Alto, Calif.) or equivalent is required to operate the sputter ion pump.

---

**X-Radiation Warning**

This device in operation may produce X-Radiation which can constitute a health hazard. Shielding or other precautions may be required.
Typical 8840 Performance with Flux Plot "D"
Electromagnet Focusing

More detailed information in the form of an application packet PWR-555, is available upon request from your RCA Field Representative or RCA Large Power Tube Application Engineering, Lancaster, PA 17604.
Linear Beam Power Tube

CERMOLOX®

Full Input to 400 MHz

7000 W Peak Sync. Output through VHF-TV Band with 16 dB Gain

ELECTRICAL

Filamentary Cathode:

Type ........................................... Thoriated-Tungsten Mesh

Voltage (ac or dc) ................................ \{ 5.7 typ. \ V

\{ 6.0 max. \ V

Current:

Typical value at 5.7 volts ...................... 128 A

Maximum value for starting even momentarily 300 A

Cold Resistance ................................. 0.005 Ω

Minimum heating time ........................... 16 s

Mu-Factor (Grid No.2 to Grid No.1) ............ 20

Direct Interelectrode Capacitances:

Grid No.1 to plate ................................ 0.40 max. pF

Grid No.1 to filament ............................ 70 pF

Plate to filament ................................ 0.05 max. pF

Grid No.1 to grid No.2 .......................... 95 pF

Grid No.2 to plate .............................. 12 pF

Grid No.2 to filament ........................... 2.5 max. pF

MECHANICAL

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

Overall Length ................................ 127.3 mm 5.01 max. in

Greatest Diameter .............................. 116.1 mm 4.57 max. in

Terminal Connections ........................... See Dimensional Outline

Sockets ........................................ See footnote p

Radiator ........................................ Integral part of tube

Weight (Approx.) ................................ (2.7 kg) 6.0 lb

THERMAL

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

Plate-Core Temperature ........................ 250 max. °C
RF Power Amplifier or Oscillator – Class C Telegraphy or Class C FM Telephony

MAXIMUM CCS RATINGS, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>8000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1650 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-450 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>4.0 max. A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>500 max. mA</td>
</tr>
<tr>
<td>Grid-No.1 Input</td>
<td>150 max. W</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>250 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>5000 max. W</td>
</tr>
</tbody>
</table>

MAXIMUM CIRCUIT VALUES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1-Circuit Resistance Under Any Conditions: With fixed bias</td>
<td>5000 max. Ω</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Grid-No.2 Circuit Impedance</td>
<td>See note g</td>
</tr>
<tr>
<td>Plate Circuit Impedance</td>
<td>See note j</td>
</tr>
</tbody>
</table>

CALCULATED CCS OPERATION

In a grid-drive circuit at 108 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6500 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-50 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.36 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>85 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>143 mA</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td>60 W</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>95 %</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>10,000 W</td>
</tr>
</tbody>
</table>

In a cathode-drive circuit at 216 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>6300 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-34 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>1.31 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>40 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>40 mA</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>50 W</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>95 %</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>4500 W</td>
</tr>
</tbody>
</table>

RF Power Amplifier — Class B Television Service
Synchronizing-level conditions per tube unless otherwise specified

**MAXIMUM CCS RATINGS, Absolute-Maximum Values**

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>8000 max. V</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1650 max. V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-450 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>5 max. A</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>5000 max. W</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>250 max. W</td>
</tr>
<tr>
<td>Grid-No.1 Input</td>
<td>150 max. W</td>
</tr>
</tbody>
</table>

**CALCULATED CCS OPERATION**

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.3 MHz

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>5030 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1000 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>2.36 A</td>
</tr>
<tr>
<td>Blanking level</td>
<td>1.80 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>47 mA</td>
</tr>
<tr>
<td>Blanking level</td>
<td>27 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td></td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>135 mA</td>
</tr>
<tr>
<td>Blanking level</td>
<td>81 mA</td>
</tr>
</tbody>
</table>

Input Circuit Efficiency 95 %

Driver Power Output

<table>
<thead>
<tr>
<th>Synchronizing level</th>
<th>145 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanking level</td>
<td>80 W</td>
</tr>
</tbody>
</table>

Plate Dissipation

| Blanking level | 5000 W |
Output Circuit Efficiency ............................................ 95 %

Useful Power Output

- Synchronizing level ........................................... 7000 W
- Blanking level .................................................. 3940 W

a Measured at tube terminals. The filament may be subjected to rf heating as the frequency of operation is increased. It is recommended that the filament voltage be operated at the lowest voltage that will give stable performance.

b For plate voltage = 2000 V, Grid No.2 voltage = 1375 V, Peak plate current = 6.0 A.

c With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) 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.

d With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) 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.

e See Dimensional Outline for temperature measurement points.

f Calculated at the -1.0 dB power point of a double-tuned output circuit using two times tube output capacity.

n Adjusted for \( I_{bo} = 650 \) mA.

p Fully engineered sockets for the 8890 tube type are available in limited quantities from RCA (Type J15283), are in production quantities from Jettron Products Inc., 56 Route 10, Hanover, NJ 07936 (Type CD89 085). For effective cooling, it is recommended that the RCA "Heat Pipe" Dev. No.J15304 be used in conjunction with these sockets.

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

f See Classes of Service,

g See Electrical Considerations - Grid-No.2 Voltage Supply.

h See Electrical Considerations - Grid-No.1 Voltage Supply.

j See Electrical Considerations - Power Supplies and Plate Voltage Supply.
# DIMENSIONAL OUTLINE

## Tabulated Dimensions*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Contact Distance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Dia.</td>
<td>4.570 max.</td>
<td>(116.1 max.)</td>
</tr>
<tr>
<td>B Dia.</td>
<td>3.235 min.</td>
<td>(82.17 min.)</td>
</tr>
<tr>
<td>C Dia.</td>
<td>3.014 min.</td>
<td>(76.56 min.)</td>
</tr>
<tr>
<td>D Dia.</td>
<td>2.307 min.</td>
<td>(58.60 min.)</td>
</tr>
<tr>
<td>E Dia.</td>
<td>1.840 min.</td>
<td>(46.74 min.)</td>
</tr>
<tr>
<td>F Dia.</td>
<td>1.210 max.</td>
<td>(30.73 max.)</td>
</tr>
<tr>
<td>G Dia.</td>
<td>1.314 min.</td>
<td>(33.38 min.)</td>
</tr>
<tr>
<td>H Dia.</td>
<td>0.620 max.</td>
<td>(15.75 max.)</td>
</tr>
<tr>
<td>J</td>
<td>4.930 + 0.080</td>
<td>(125.2 ± 2.0)</td>
</tr>
<tr>
<td>K</td>
<td>4.300 ± 0.050</td>
<td>(109.2 ± 1.2)</td>
</tr>
<tr>
<td>M</td>
<td>1.790 ± 0.040</td>
<td>(45.47 ± 1.01)</td>
</tr>
<tr>
<td>N</td>
<td>1.330 ± 0.030</td>
<td>(33.78 ± .76)</td>
</tr>
<tr>
<td>P</td>
<td>1.005 ± 0.020</td>
<td>(25.53 ± .51)</td>
</tr>
<tr>
<td>R</td>
<td>0.200 ± 0.025</td>
<td>(5.08 ± .63)</td>
</tr>
<tr>
<td>S</td>
<td>0.475 ± 0.030</td>
<td>(12.06 ± .76)</td>
</tr>
<tr>
<td>T</td>
<td>0.650 ± 0.030</td>
<td>(16.51 ± .76)</td>
</tr>
</tbody>
</table>

### Notes

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

1.a Radiator
1.b Plate Terminal
1.c Grid No.2 Terminal
1.d Grid No.1 Terminal
1.e Cathode-Filament Terminal
1.f Filament Terminal ID
1.g Heat Sink Terminal

**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 RCA Power Tube Application Engineering, Lancaster, PA.

**Note 3** — Tapped 1/4-20 NC x 0.5 inch (12.7 mm) deep.
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 a plate dissipation of 5000 watts and an incoming air temperature of 50° C, and air flow of 105 cfm is required in accordance with the Typical Cooling Characteristics.

To Plate, Grid-No.2, Grid-No.1, Filament-Cathode, 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. In normal operation this value is approximately 40 cfm (18.8 x 10³ cc/s).

During Standby Operation — Cooling air is required when 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

P — Plate Terminal
G₁ — Grid No.1 Terminal
G₂ — Grid No.2 Terminal
K-F — Cathode-Filament Terminal
F — Filament Terminal
TYPICAL COOLING CHARACTERISTICS

INCOMING AIR TEMPERATURE 50°C PLATE DISSIPATION Watts

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2000</td>
</tr>
<tr>
<td>B</td>
<td>3000</td>
</tr>
<tr>
<td>C</td>
<td>4000</td>
</tr>
<tr>
<td>D</td>
<td>5000</td>
</tr>
</tbody>
</table>

DIRECTION OF AIR FLOW

EQUS

AIR FLOW — CUBIC FEET PER MINUTE

PLATE CORE TEMPERATURE °C (SOLID LINE)

PRESSURE DROP — INCHES H₂O (DASHED LINE)

92LM-3223

Electronic Components
TYPICAL CONSTANT CURRENT CHARACTERISTICS

FILAMENT VOLTAGE $E_1 = 5.7$ V
GRID No. 2 VOLTAGE $E_{22} = 1000$ V
PLATE CURRENT $I_b = \ldots$
GRID No. 1 CURRENT $I_{c1} = \ldots$
GRID No. 2 CURRENT $I_{c2} = \ldots$

GRID No. 1 VOLTAGE — VOLTS
GRID No. 2 VOLTAGE — VOLTS
PLATE VOLTAGE — KILOVOLTS

$I_{c1} = 3.0$ A
$I_{c} = 12$ A

Electronic Components

DATA 5
2-71
TYPICAL CONSTANT CURRENT CHARACTERISTICS

FILAMENT VOLTAGE $E_f = 5.7 \text{ V}$
GRID No. 2 VOLTAGE $E_{g2} = 1500 \text{ V}$
PLATE CURRENT $I_p = \ldots$
GRID No. 1 CURRENT $I_{c1} = \ldots$
GRID No. 2 CURRENT $I_{c2} = \ldots$

---

PLATE VOLTAGE - KILOVOLTS

---

Electronic Components
**Beam Power Tube**

**CERMOLOX®**  
Full Input to 400 MHz

20.0 Kilowatt Peak Sync. Output Through  
VHF-TV Band at 13 dB Gain

**ELECTRICAL**

Filamentary Cathode, Thoriated-Tungsten Mesh Type

<table>
<thead>
<tr>
<th>Voltagea (AC or DC)</th>
<th>9.5 typ.</th>
<th>10.0 max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical value at 9.5 V</td>
<td>163</td>
<td>A</td>
</tr>
<tr>
<td>Maximum value for starting even momentarily</td>
<td>300</td>
<td>A</td>
</tr>
<tr>
<td>Cold resistance</td>
<td>0.01</td>
<td>Ω</td>
</tr>
<tr>
<td>Minimum heating time</td>
<td>15</td>
<td>s</td>
</tr>
</tbody>
</table>

**Mu Factorb (Grid No.2 to Grid No.1)**  12.5

Direct Inter electrode Capacitances:

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid No.1 to platec</td>
<td>0.4 max. pF</td>
</tr>
<tr>
<td>Grid No.1 to filament</td>
<td>100 pF</td>
</tr>
<tr>
<td>Plate to filamentc,d</td>
<td>0.15 max. pF</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>86 pF</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>20 pF</td>
</tr>
<tr>
<td>Grid No.2 to filamentd</td>
<td>4.0 max. pF</td>
</tr>
</tbody>
</table>

**MECHANICAL**

Operating Position: Vertical, either end up

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Length</td>
<td>(180.3 mm) 7.100 max. in</td>
</tr>
<tr>
<td>Greatest Diameter</td>
<td>(210.4 mm) 8.285 max. in</td>
</tr>
<tr>
<td>Radiator</td>
<td>Integral part of tube</td>
</tr>
<tr>
<td>Weight (Approx.)</td>
<td>(10.0 kg) 22 lb</td>
</tr>
</tbody>
</table>

**THERMAL**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal Temperature</td>
<td>260 max. °C</td>
</tr>
<tr>
<td>(Plate, grid No.2, grid No.1, cathode-filament, and filament)</td>
<td></td>
</tr>
<tr>
<td>Plate Core Temperature</td>
<td>260 max. °C</td>
</tr>
</tbody>
</table>

**RCA Electronic Components**
RF Power Amplifier
Class B Television Service

Synchronizing level conditions per tube unless otherwise specified.

MAXIMUM CCS RATINGS, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>9,000 max. V</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid No.2 Voltage</td>
<td>2,000 max. V</td>
</tr>
<tr>
<td>DC Grid No.1 Voltage</td>
<td>-600 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>6.0 max. A</td>
</tr>
<tr>
<td>Grid No.2 Input</td>
<td>450 max. W</td>
</tr>
<tr>
<td>Grid No.1 Input</td>
<td>250 max. W</td>
</tr>
</tbody>
</table>

Plate Dissipation: See Note m

Calculated CCS Operation:
In a cathode-drive circuit at 216 MHz and a bandwidth of 6.0 MHz:

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>6,580 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Grid No.2 Voltage</td>
<td>1,000 V</td>
</tr>
<tr>
<td>DC Grid No.1 Voltage</td>
<td>-115 V</td>
</tr>
<tr>
<td>Zero Signal DC Plate Current</td>
<td>1.0 A</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>660 Ω</td>
</tr>
</tbody>
</table>

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

**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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10,000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>2,000 max. V</td>
</tr>
<tr>
<td>DC Plate Current at Peak of Envelope</td>
<td>6.0 max. A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>500 max. mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>450 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>15 max. kW</td>
</tr>
</tbody>
</table>

### MAXIMUM CIRCUIT VALUES

**Grid-No.1-Circuit Resistance Under Any Conditions:**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>With fixed bias</td>
<td>5,000 max. Ω</td>
</tr>
<tr>
<td>With fixed bias (In Class AB₁ operation)</td>
<td>25,000 max. Ω</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

**Grid-No.2 Circuit Impedance**

See Note h

**Plate Circuit Impedance**

See Note g

**Calculated Class AB₁ CCS Operation with “Two-Tone” Modulation**

In a grid-drive circuit at 7 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>8,000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1,500 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-191 V</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>1.0 A</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>978.5 Ω</td>
</tr>
<tr>
<td>DC Plate Current (At peak of envelope)</td>
<td>3.91 A</td>
</tr>
<tr>
<td>Average DC Plate Current</td>
<td>2.49 A</td>
</tr>
<tr>
<td>DC Grid-No.2 Current (At peak of envelope)</td>
<td>137 mA</td>
</tr>
<tr>
<td>Average DC Grid-No.2 Current</td>
<td>53 mA</td>
</tr>
<tr>
<td>Peak Envelope Drive Power</td>
<td>See Note n</td>
</tr>
<tr>
<td>Output Circuit Efficiency (Approx.)</td>
<td>95 %</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>8,750 W</td>
</tr>
<tr>
<td>Peak envelope</td>
<td>17,500 W</td>
</tr>
</tbody>
</table>
Linear RF Power Amplifier

Class AB or Class B Telephony

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

MAXIMUM CCS RATINGS, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10,000 max. V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>2,000 max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>3.0 max. A</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>300 max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>See Note m</td>
</tr>
</tbody>
</table>

Calculated CCS Operation

In a cathode drive circuit at 400 MHz.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>8,000 V</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>1,500 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-235 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>2.47 A</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>0 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>24 mA</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td>500 W</td>
</tr>
<tr>
<td>Output Circuit Efficiency</td>
<td>80 %</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>5,000 W</td>
</tr>
</tbody>
</table>

- 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.

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

- With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) 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.

- With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) 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.

- See Dimensional Outline for Temperature Measurement Points.
k. 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 $\sqrt{1.5}$.

m. Permitted plate dissipation is a function of cooling. For specific ratings see Forced Air Cooling information.

n. 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.

p. 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.

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

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

f. See Section Class of Service.

g. See Section Electrical Considerations - Power Supplies and Plate Voltage Supply.

h. See Section Electrical Considerations - Grid-No.2 Voltage Supply.

i. See Section Electrical Considerations - Grid-No.1 Voltage Supply.

DIMENSIONAL OUTLINE NOTES

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

<table>
<thead>
<tr>
<th>Contact Distance</th>
<th>inch (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Radiator</td>
<td>0.800 (20.32)</td>
</tr>
<tr>
<td>1b. Plate Terminal</td>
<td>0.265 (6.73)</td>
</tr>
<tr>
<td>1c. Grid No.2 Terminal</td>
<td>0.265 (6.73)</td>
</tr>
<tr>
<td>1d. Grid No.1 Terminal</td>
<td>0.265 (6.73)</td>
</tr>
<tr>
<td>1e. Cathode-Filament Terminal</td>
<td>0.250 (6.35)</td>
</tr>
<tr>
<td>1f. Filament Terminal</td>
<td>0.265 (6.73)</td>
</tr>
<tr>
<td>1g. Heat Sink (post)</td>
<td>0.450 (11.43)</td>
</tr>
</tbody>
</table>

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 RCA Power Tube Application Engineering, Lancaster, PA 17604.

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

TABULATED DIMENSIONS

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

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:

<table>
<thead>
<tr>
<th>Plate Dissipation</th>
<th>Air Flow</th>
<th>Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilowatts</td>
<td>CFM</td>
<td>Inches H₂O</td>
</tr>
<tr>
<td>12.5</td>
<td>350</td>
<td>1.75</td>
</tr>
<tr>
<td>15.0</td>
<td>425</td>
<td>2.50</td>
</tr>
<tr>
<td>17.5</td>
<td>550</td>
<td>3.50</td>
</tr>
</tbody>
</table>

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.

**TERMINAL DIAGRAM**

P — Plate Terminal
G2 — Grid-No.2 Terminal
G1 — Grid-No.1 Terminal
K-F — Cathode Filament Terminal
F — Filament Terminal

**ELECTRODE CAVITY TUNING CHARACTERISTICS**
TYPICAL COOLING CHARACTERISTICS

<table>
<thead>
<tr>
<th>CURVE</th>
<th>PLATE DISSIPATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>17.5 kW</td>
</tr>
<tr>
<td>B</td>
<td>15.0 kW</td>
</tr>
<tr>
<td>C</td>
<td>12.5 kW</td>
</tr>
<tr>
<td>D</td>
<td>10.0 kW</td>
</tr>
</tbody>
</table>

AIR FLOW/CORE TEMP

AIR FLOW/PRESS DROP

DIRECTION OF AIR FLOW

INCOMING AIR TEMP = 400°C
AT ONE STD ATMOS.

Electronic Components
TYPICAL CONSTANT CURRENT CHARACTERISTICS

- PLATE CURRENT $I_b$
- GRID No.1 CURRENT $I_{C1}$
- GRID No.2 CURRENT $I_{C2}$
- FILAMENT VOLTAGE $E_f = 9.5V$
- GRID No.2 VOLTAGE $E_{C2} = 1000V$

PLATE VOLTAGE - KILOVOLTS

GRID No.1 VOLTAGE - VOLTS

GRID No.2 CURRENT $I_{C2}$
- $I_{C2} = 1.0$
- $I_{C2} = 6.0$

PLATE CURRENT $I_b$
- $I_b = 25A$
- $I_b = 20A$
- $I_b = 15A$
- $I_b = 10A$
- $I_b = 5A$
- $I_b = 2.5A$
- $I_b = 1.0A$
- $I_b = 0.5A$
- $I_b = 0.2A$
- $I_b = 0.1A$
- $I_b = 0.05A$
- $I_b = 0.005A$

RCA Electronic Components

DATA 6
4-71
TYPICAL CONSTANT CURRENT CHARACTERISTICS

PLATE CURRENT $I_b$
GRID No.1 CURRENT $I_{ci}$
GRID No.2 CURRENT $I_{c2}$
FILAMENT VOLTAGE $E_f = 9.5V$
GRID No.2 VOLTAGE $E_{c2} = 1500V$

GRID No. 1 VOLTAGE — VOLTS

GRID No. 2 VOLTAGE — VOLTS

PLATE VOLTAGE — KILOVOLTS

92LM-2658R3

RCA Electronic Components
VHF Linear Power Amplifier Tube

27.5 Kilowatt Peak Sync. Output thru VHF-TV Band

- CERMOLOX® Construction
- 13 dB Gain
- Efficient Forced-Air Cooling
- High Gain-Bandwidth Products
- Full Input to 400 MHz

ELECTRICAL
Filamentary Cathode, Thoriated-Tungsten Mesh Type

Voltage (ac or dc) ........................................... 9.5 typ.\d V

Current:

Typical value at 9.5 volts .................. 153 A
Maximum value for starting, even momentarily .................. 300 A
Cold resistance .................. 0.01 \Omega
Minimum heating time .................. 15 sec
Mu-Factor\d, (Grid No.2 to Grid No.1) ........ 12.5

Direct Interelectrode Capacitances:

Grid No.1 to plate \c .......................... 0.4 max. pF
Grid No.1 to filament .......................... 100 pF
Plate to filament \c,d .......................... 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 \d .......................... 4.0 max. pF

MECHANICAL
Operating Position .................. Vertical, either end up

Overall Length (max.) .................. (180.3 mm) 7.10 in

Greatest Diameter .................. (210.4 mm) 8.285 in

Radiator .................. Integral part of tube

Weight (Approx.) .................. (10.0 kg) 22 lbs

THERMAL

Seal Temperature \e .......................... 250 max. °C
(Plate, Grid No.2, Grid-No.1, Cathode-Filament, and Filament)

Plate-Core Temperature \e,f .......................... 275 max. °C
RF Power Amplifier
Class B Television Service

Synchronizing-level conditions per tube unless otherwise specified.

MAXIMUM CCS RATINGS, Absolute-Maximum Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>10,000</td>
<td>max. V</td>
</tr>
<tr>
<td>DC Grid No.2 Voltage k</td>
<td>2000</td>
<td>max. V</td>
</tr>
<tr>
<td>DC Grid No.1 Voltage m</td>
<td>-600</td>
<td>max. V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>6.0</td>
<td>max. A</td>
</tr>
<tr>
<td>Grid No.2 Input</td>
<td>450</td>
<td>max. W</td>
</tr>
<tr>
<td>Grid No.1 Input</td>
<td>250</td>
<td>max. W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>See notes f &amp; p</td>
<td></td>
</tr>
</tbody>
</table>

TYPICAL CCS OPERATION

In a cathode-drive circuit at 216 MHz and a bandwidth of 6.3 MHz.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>7800 - 8300</td>
<td>V</td>
</tr>
<tr>
<td>DC Grid No.2 Voltage k</td>
<td>1000 - 1500</td>
<td>V</td>
</tr>
<tr>
<td>DC Grid No.1 Voltage m</td>
<td>-110 - -190</td>
<td>V</td>
</tr>
<tr>
<td>Zero Signal DC Plate Current</td>
<td>1.25</td>
<td>A</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>670</td>
<td>Ω</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td></td>
<td>5.8</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td></td>
<td>5.75</td>
</tr>
<tr>
<td>Blanking level</td>
<td></td>
<td>4.4</td>
</tr>
<tr>
<td>Blanking level</td>
<td></td>
<td>4.40</td>
</tr>
<tr>
<td>DC Grid No.2 Current k</td>
<td>120 - 190</td>
<td>mA</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td></td>
<td>120</td>
</tr>
<tr>
<td>Blanking level</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>DC Grid No.1 Current m</td>
<td>700 - 140</td>
<td>mA</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td>Blanking level</td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>Input Circuit Efficiency (Approx.)</td>
<td>85</td>
<td>%</td>
</tr>
<tr>
<td>Driver Power Output</td>
<td></td>
<td>95</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td>1240 - 1300</td>
<td>W</td>
</tr>
<tr>
<td>Blanking level</td>
<td>700 - 790</td>
<td>W</td>
</tr>
<tr>
<td>Output Circuit Efficiency (Approx.)</td>
<td>95</td>
<td>%</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td></td>
<td>27,500 - 27,500</td>
</tr>
<tr>
<td>Synchronizing level</td>
<td></td>
<td>15,500 - 15,500</td>
</tr>
<tr>
<td>Blanking level</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RCA Electronic Components

DATA 1
Linear RF Power Amplifier
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 | 10,000 max. V |
| DC Grid-No.2 Voltage | 2,000 max. V |
| DC Plate Current at Peak of Envelope | 6.0 max. A |
| DC Grid-No.1 Current | 500 max. mA |
| Grid-No.2 Input | 450 max. W |
| Plate Dissipation | See Notes f & p |

MAXIMUM CIRCUIT VALUES.

Grid-No.1-Circuit Resistance Under Any Conditions:
- With fixed bias | 5.000 max. Ω |
- With fixed bias (in Class AB₁ operation) | 25,000 max. Ω |
- With cathode bias | Not recommended |

Grid-No.2 Circuit Impedance | See Note k |
Plate Circuit Impedance | See Note j |

CALCULATED CLASS AB₁ OPERATION WITH "TWO-TONE" MODULATION

In a grid-drive circuit at 7 MHz

| DC Plate Voltage | 8,000 V |
| DC Grid-No.2 Voltage | 1,500 V |
| DC Grid-No.1 Voltage | −190 V |
| Zero-Signal DC Plate Current | 1.0 A |
| Effective RF Load Resistance | 978.5 Ω |
| DC Plate Current (At peak of envelope) | 3.90 A |
| Average DC Plate Current | 2.50 A |
| DC Grid-No.2 Current (At peak of envelope) | 140 mA |
| Average DC Grid-No.2 Current | 55 mA |
| Peak Envelope Drive Power | See Note r |
| Output Circuit Efficiency (Approx.) | 96 % |
| Useful Power Output (Approx.) | |
| Average | 8,750 W |
| Peak envelope | 17,500 W |
Linear RF Power Amplifier

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: 10,000 max. V
- DC Grid-No.2 Voltage: 2,000 max. V
- DC Plate Current: 3.0 max. A
- Grid-No.2 Input: 300 max. W
- Plate Dissipation: See Notes f & p

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: -235 V
- DC Plate Current: 2.50 A
- DC Grid-No.1 Current: 0 mA
- DC Grid-No.2 Current: 25 mA
- Driver Power Output: 500 W
- Output Circuit Efficiency (Approx.): 80 %
- Useful Power Output: 5,000 W

---

a 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.

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

c With external flat metal shield 8" (200 mm) in diameter having a center hole 3" (76 mm) 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.

d With external flat metal shield 8" (200 mm) in diameter having a center hole 2-3/8" (60 mm) 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.

e See Dimensional Outline for Temperature Measurement Points.
The value of 275°C is the average of three readings taken 120° apart around the periphery of the anode core. No one reading may exceed 300°C.

The maximum voltage and air flow rates must be modified to obtain adequate holdoff voltage and cooling at temperatures in excess of 350°C and altitudes above 7000 feet.

The bandwidth of 6.3 MHz is calculated at the -0.72 dB power points of a double tuned output circuit using two times the tube output capacity and a damping factor of \( \sqrt{1.5} \) as shown in BANDWIDTH CALCULATION below.

Permitted plate dissipation is a function of cooling. For specific ratings see Forced Air Cooling information.

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 circuits used. The tube driving power is approximately zero watts.

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

The following footnotes apply to the RCA Transmitting Tube operating considerations given at the front of this section.

See Classes of Service.

See Plate Voltage Supply.

See Grid-No. 2 Voltage Supply.

See Grid-No. 1 Voltage Supply.

**BANDWIDTH CALCULATION**
FORCED-AIR COOLING

Air Flow:
Through radiator-adequate air flow to limit the plate-core temperature to 275\(^\circ\) 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, related to sea level and at a temperature of 35\(^\circ\) C, is as follows:

<table>
<thead>
<tr>
<th>Plate Dissipation</th>
<th>Air Flow</th>
<th>Pressure Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilowatts</td>
<td>CFM</td>
<td>Inches H(_2)O</td>
</tr>
<tr>
<td>18.0</td>
<td>520</td>
<td>3.75</td>
</tr>
<tr>
<td>20.0</td>
<td>600</td>
<td>4.50</td>
</tr>
<tr>
<td>22.0</td>
<td>800</td>
<td>6.30</td>
</tr>
</tbody>
</table>

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\(^\circ\) 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.

---

**Diagram:**

- P — Plate Terminal
- G\(_2\) — Grid-No.2 Terminal
- G\(_1\) — Grid-No.1 Terminal
- K-F — Cathode-Filament Terminal
- F — Filament Terminal
### TABULATED DIMENSIONS*

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

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

<table>
<thead>
<tr>
<th>Contact Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Radiator</td>
</tr>
<tr>
<td>1b. Plate Terminal</td>
</tr>
<tr>
<td>1c. Grid No.2 Terminal</td>
</tr>
<tr>
<td>1d. Grid No.1 Terminal</td>
</tr>
<tr>
<td>1e. Cathode-Filament Terminal</td>
</tr>
<tr>
<td>1f. Filament Terminal</td>
</tr>
<tr>
<td>1g. Heat Sink (post)</td>
</tr>
</tbody>
</table>

**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 RCA Power Tube Application Engineering, Lancaster, PA 17604.

**Note 3** — Tapped 1/4-20 NC x 0.6 in (12.7 mm) deep.

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*Dimensions are in inches unless otherwise stated. Dimensions in parentheses are in millimeters and are derived from the basic inch dimension (1 inch = 25.4 mm).
MOUNTING

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

Ready-made sockets may be obtained, in limited quantities, from RCA as the J15293, or in production quantities as the CD 89-094, from Jettron Products Inc., 56 Route 10, Hanover, NJ 07936.

PREFERRED MOUNTING ARRANGEMENT

[Diagram of preferred mounting arrangement with notes and dimensions labeled A, B, C, D, E, F, and G.]
PREFERRED MOUNTING ARRANGEMENT (CONT'D)

8 SLOTS EQUALLY SPACED
0.030" (.78mm) WIDE
0.500" (12.7mm) DEEP

NOTE 3: WALLA SLOTS EQUALLY SPACED 0.030" - 0.500"

NOTE 3: DEEP SLOTS AM WIDE X AN DEEP EQUALLY SPACED 0.030"

NOTE 3: HOLES AK DNA. EQUALLY SPACED 0.030"
### MOUNTING ARRANGEMENT
#### TABULATED DIMENSIONS

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Inches</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.320</td>
<td>( 33.53)</td>
</tr>
<tr>
<td>8 Dia.</td>
<td>4.440</td>
<td>(112.78)</td>
</tr>
<tr>
<td>C Dia.</td>
<td>4.095</td>
<td>(104.02)</td>
</tr>
<tr>
<td>D</td>
<td>1.713</td>
<td>( 43.51)</td>
</tr>
<tr>
<td>E</td>
<td>0.330</td>
<td>(  8.38)</td>
</tr>
<tr>
<td>F Dia.</td>
<td>3.495</td>
<td>( 88.77)</td>
</tr>
<tr>
<td>G Dia.</td>
<td>3.000</td>
<td>( 76.20)</td>
</tr>
<tr>
<td>H Dia.</td>
<td>1.975</td>
<td>(50.17, +0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( -0.00, -0.00)</td>
</tr>
<tr>
<td>J Dia.</td>
<td>0.810</td>
<td>( 20.57)</td>
</tr>
<tr>
<td>K</td>
<td>0.250</td>
<td>(  6.35)</td>
</tr>
<tr>
<td>L</td>
<td>0.312</td>
<td>(  7.92)</td>
</tr>
<tr>
<td>M</td>
<td>1.812</td>
<td>( 49.98)</td>
</tr>
<tr>
<td>N</td>
<td>0.625</td>
<td>( 15.88)</td>
</tr>
<tr>
<td>P</td>
<td>0.250</td>
<td>(  6.35)</td>
</tr>
<tr>
<td>R Dia.</td>
<td>0.261</td>
<td>(  6.63)</td>
</tr>
<tr>
<td>S Dia.</td>
<td>0.700</td>
<td>( 17.78)</td>
</tr>
<tr>
<td>T Dia.</td>
<td>0.918</td>
<td>( 23.32)</td>
</tr>
<tr>
<td>U Dia.</td>
<td>1.135</td>
<td>( 28.83)</td>
</tr>
<tr>
<td>V Dia.</td>
<td>1.737</td>
<td>( 44.11)</td>
</tr>
<tr>
<td>W</td>
<td>1.125</td>
<td>( 28.58)</td>
</tr>
<tr>
<td>AA Dia.</td>
<td>2.625</td>
<td>( 66.68)</td>
</tr>
<tr>
<td>A8</td>
<td>45°</td>
<td></td>
</tr>
<tr>
<td>AC</td>
<td>1.25</td>
<td>( 31.75)</td>
</tr>
<tr>
<td>AD</td>
<td>1.00</td>
<td>( 25.40)</td>
</tr>
<tr>
<td>AE</td>
<td>0.40</td>
<td>( 10.16)</td>
</tr>
<tr>
<td>AF Dia.</td>
<td>2.681</td>
<td>(68.10, +0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( +0.02)</td>
</tr>
<tr>
<td>AG Dia.</td>
<td>2.840</td>
<td>( 72.14)</td>
</tr>
<tr>
<td>AH Dia.</td>
<td>3.00</td>
<td>( 76.20)</td>
</tr>
<tr>
<td>AJ</td>
<td>22-1/2°</td>
<td></td>
</tr>
<tr>
<td>AK Dia.</td>
<td>0.281</td>
<td>(  7.14)</td>
</tr>
<tr>
<td>AM</td>
<td>0.125</td>
<td>(  3.18)</td>
</tr>
<tr>
<td>AN</td>
<td>1.000</td>
<td>( 25.40)</td>
</tr>
<tr>
<td>AP Radius</td>
<td>0.125</td>
<td>(  3.18)</td>
</tr>
</tbody>
</table>

**Note 1** — Finger stock is 97-139 made by Instrument Specialties Co., Little Falls, NJ.

**Note 2** — Finger stock is 97-360 made by Instrument Specialties Co., Little Falls, NJ.

**Note 3** — Round all corners.
TYPICAL CONSTANT CURRENT CHARACTERISTICS

PLATE CURRENT $I_D$
GRID No.1 CURRENT $I_{C1}$
GRID No.2 CURRENT $I_{C2}$
FILAMENT VOLTAGE $E_f = 9.5V$
GRID No.2 VOLTAGE $E_{C2} = 1000V$

<table>
<thead>
<tr>
<th>$I_{C1}$</th>
<th>$I_{C2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.005A</td>
<td>6</td>
</tr>
<tr>
<td>0.05A</td>
<td>3</td>
</tr>
<tr>
<td>0.1A</td>
<td>1</td>
</tr>
<tr>
<td>0.2A</td>
<td>2</td>
</tr>
<tr>
<td>0.5A</td>
<td>4</td>
</tr>
<tr>
<td>1.0</td>
<td>10A</td>
</tr>
<tr>
<td>1.5A</td>
<td>20A</td>
</tr>
<tr>
<td>2.0</td>
<td>25A</td>
</tr>
<tr>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>25A</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

GRID No.1 VOLTAGE - VOLTS
PLATE VOLTAGE - KILOVOLTS

92LM-2864R2

RCA Electronic Components
TYPICAL CONSTANT CURRENT CHARACTERISTICS

PLATE CURRENT $I_b$
GRID No. 1 CURRENT $I_{c1}$
GRID No. 2 CURRENT $I_{c2}$
FILAMENT VOLTAGE $E_f = 9.5 \text{ V}$
GRID No. 2 VOLTAGE $E_{c2} = 1500 \text{ V}$

GRID No. 1 VOLTAGE - VOLTS
GRID No. 2 VOLTAGE - VOLTS

PLATE VOLTAGE - KILOVOLTS

$I_c = 1.3 \text{ A}$, $0.85, 0.25$

5A, 4A, 3A, 2A, 1A, 0A, 0.5A, 0.25A, 0.1A, 0.05A, 0.005A

RCA Electronic Components
DATA 7
7-71
CAVITY LENGTH - INCHES

ELECTRODE CAVITY TUNING CHARACTERISTICS

FREQUENCY MHz
ELECTRODE CAVITY TUNING CHARACTERISTICS

GRID 1 TO GRID 2

GRID No. 1 TO GRID No. 2

CATHODE LENGTH - INCHES

FREQUENCY MHZ

1/4 \lambda
1/2 \lambda
3/4 \lambda

Z_0 = 5.25 OHMS

DATA 8 ELECTRONIC COMPONENTS

8916
ELECTRODE CAVITY TUNING CHARACTERISTICS

GRID 1 TO CATHODE

CAVITY LENGTH - INCHES

C1/4 λ

FREQUENCY MHz

0 200 400 600 800