Beam Power Tube

FORCED-AIR COOLED

CERAMIC-METAL SEALS 380 WATTS PEP OUTPUT AT 30 Mc
COAXIAL ELECTRODE STRUCTURE 300 WATTS CW OUTPUT AT 470 Mc
UNIPOTENTIAL CATHODE INTEGRAL RADIATOR

Full Ratings up to 500 Mc

GENERAL DATA

Electrical:
Heater, for Unipotential Cathode:
  Voltage (AC or DC).......................... 13.5 ± 10% volts
  Current at 13.5 volts...................... 1.3 amp
  Minimum heating time...................... 60 sec
Mu-Factor, Grid No.2 to Grid No.1
  for plate volts = 450, grid-No.2
  volts = 325, plate amperes = 1.2........ 12
Direct Interelectrode Capacitances:
  Grid No.1 to plate........................ 0.13 max. μμf
  Grid No.1 to cathode ....................... 16 μμf
  Plate to cathode ........................... 0.011 μμf
  Grid No.1 to grid No.2 .................... 22 μμf
  Grid No.2 to plate ......................... 6.5 μμf
  Grid No.2 to cathode ....................... 3.2 μμf
  Cathode to heater ........................ 3.4 μμf

Mechanical:
Operating Position ................................ Any
Maximum Overall Length .......................... 2.26"
Seated Length .................................. 1.920" ± 0.065"
Diameter ...................................... 1.625" ± 0.015"
Weight (Approx.) .................................. 3.5 oz
Socket ........................................ Mycalex® No.CP464-2, or equivalent
Base .......................................... Large-Wafer Elevenar 11-Pin with Ring
(JEDEC No.E11-81)

Terminal Connections (See Dimensional Outline):
  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
CAP - Plate
Radiator - Plate
Radiator - Plate
RING - Grid No.2
RING - Grid No.2
Contact
Contact
Surface
Surface

Thermal:
Terminal Temperature (All terminals) .... 250 max. °C
Radiator Core Temperature (See Dimensional Outline) .... 250 max. °C

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

DATA 1
3-62
Air Flow:
See accompanying Typical Cooling Requirements curve.

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>400 max. watts</td>
</tr>
<tr>
<td>GRID-No.2 DISSIPATION</td>
<td>8 max. watts</td>
</tr>
</tbody>
</table>

PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode. 150 max. volts
Heater positive with respect to cathode. 150 max. volts

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>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>-35 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>100 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>3050 ohms</td>
</tr>
<tr>
<td>DC Plate Current:</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope</td>
<td>335 ma</td>
</tr>
<tr>
<td>Average</td>
<td>250 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>0.05 g ma</td>
</tr>
<tr>
<td>Peak-of-Envelope Driver Power Output</td>
<td>0.3 watt</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>29 db</td>
</tr>
<tr>
<td>Fifth order</td>
<td>32 db</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td></td>
</tr>
<tr>
<td>Peak of envelope</td>
<td>380 k watts</td>
</tr>
<tr>
<td>Average</td>
<td>190 k 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</td>
<td></td>
</tr>
<tr>
<td>under any condition:</td>
<td></td>
</tr>
<tr>
<td>With fixed bias</td>
<td>25000 max. ohms</td>
</tr>
<tr>
<td>With fixed bias (in Class-AB₁ operation)</td>
<td>100000 max. ohms</td>
</tr>
<tr>
<td>With cathode bias</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Grid-No.2 Circuit Impedance</td>
<td>100000 max. ohms</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td>m</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:

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<th>Value</th>
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<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</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. watts</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>400 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:

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>700 1000 1500 2000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>175 200 200 200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-10 -30 -30 -30 volts</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>
<tr>
<td>DC Grid-No.1 Current</td>
<td>50 40 40 30 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1.2 2 2 2 watts</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>120k 175k 275k 375k 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 1000 1500 2000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>200 200 200 200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 -30 -30 -30 volts</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>10 10 5 5 ma</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>30 30 30 30 ma</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>5 5 5 5 watts</td>
</tr>
<tr>
<td>Useful Power Output</td>
<td>100p 165p 235p 300p watts</td>
</tr>
</tbody>
</table>

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                    | m             |

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 Mc, heater volts = 12.5 (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. 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.

f Obtained preferably from a separate, well-regulated source.

g This value represents the approximate grid-No. 1 current obtained due to initial voltage drop, grid resistances and contact potential effects when grid No. 1 is driven to zero volts at maximum signal.

h 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.

i With maximum signal output used as a reference, and without the use of feedback to enhance linearity.

j This value of useful power is measured at load of output circuit.

k The tube should see an effective plate supply impedance which limits the peak current through the tube under surge conditions to 15 amperes.

l 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.

m 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>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heater Current</td>
<td>1</td>
<td>1.15</td>
<td>1.45</td>
<td>amp</td>
</tr>
<tr>
<td>2. Direct Interelectrode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitances:</td>
<td>2</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>µf</td>
</tr>
<tr>
<td>Grid No.1 to cathode</td>
<td>-</td>
<td>14.3</td>
<td>17.7</td>
<td>µf</td>
</tr>
<tr>
<td>Plate to cathode</td>
<td>-</td>
<td>0.0065</td>
<td>0.0155</td>
<td>µf</td>
</tr>
<tr>
<td>Grid No.1 to grid No.2</td>
<td>-</td>
<td>19.8</td>
<td>24.2</td>
<td>µf</td>
</tr>
<tr>
<td>Grid No.2 to plate</td>
<td>-</td>
<td>5.7</td>
<td>7.1</td>
<td>µf</td>
</tr>
<tr>
<td>Grid No.2 to cathode</td>
<td>-</td>
<td>2.6</td>
<td>3.6</td>
<td>µf</td>
</tr>
<tr>
<td>Cathode to heater</td>
<td>-</td>
<td>2.5</td>
<td>4.1</td>
<td>µf</td>
</tr>
<tr>
<td>3. Grid-No.1 Voltage</td>
<td>1.3</td>
<td>-8</td>
<td>-19</td>
<td>volts</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>-</td>
<td>peak amp</td>
</tr>
<tr>
<td>7. Interelectrode Leakage Resistance</td>
<td>5</td>
<td>1</td>
<td>-</td>
<td>megohm</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 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°C 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" 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 DIRECTED THROUGH RADIATOR WITH AIR CHIMNEY SK-606 (EITEL-McCULLOUGH INC.), AND SOCKET CD464-2 (MYCALEX CORP. OF AMERICA), AND BY-PASS CAPACITOR (E.F. JOHNSON CO.)

PLATE-CORE TEMPERATURE — 250° C.
INCOMING-AIR TEMPERATURE — 24° C.

AIR FLOW — CUBIC FEET PER MINUTE

<table>
<thead>
<tr>
<th>Air Flow</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Dissipation</td>
<td>0</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>Watts (Solid Line)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Drop</td>
<td>0</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inches of Water (Dashed Line)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

92CM-11299
TYPICAL PLATE CHARACTERISTICS

HEATER VOLTS = 13.5
GRID - No. 2 VOLTS = 250
GRID - No. 1 VOLTS = \( E_{C1} \)

PLATE AMPERES

PLATE VOLTS

92CM-11288

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

HEATER VOLTS = 13.5
GRID No. 2 VOLTS = 150
GRID No. 1 VOLTS = EC1

PLATE AMPERES

PLATE VOLTS

92CM-11289
TYPICAL CHARACTERISTICS

HEATER VOLTS = 13.5
GRID-No.2 VOLTS = 400
GRID-No.1 VOLTS = $E_{C1}$

$I_{C1}$

$I_{C2}$

GRID-No.1 ($I_{C1}$) OR GRID-No.2 ($I_{C2}$) MILLIAMPERES

PLATE VOLTS

$E_{C1} = +15$

$E_{C2} = +10$

$E_{C1} = +5$

$E_{C2} = +5$

92CM-11293RI

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 = $E_C$

$IC_1$ = ______

$IC_2$ = ______
TYPICAL CHARACTERISTICS

HEATER VOLTS: 13.5
GRID-No.2 VOLTS: 150
GRID-No.1 VOLTS: EC1
IC1 = +20
IC2 = -

0  200  400  600  800
PLATE VOLTS

0  50  100  150  200
GRID-No.1 (IC1) OR GRID-No.2 (IC2) MILLIAMPERES

+5  +10  +15  +20

92CM-11292
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)\(^a\) .................................. 13.5 \pm 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\(^b\)

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 ........................................ 7 pF
Grid No.2 to cathode ...................................... 2.6 pF
Cathode to heater ........................................ 3.4 pF

MECHANICAL

Operating Position ........................................ Any
Maximum Overall Length ................................ 2.26 in
Seated Length ............................................ 1.920 \pm 0.065 in
Diameter .................................................. 1.625 \pm 0.015 in
Weight (Approx.) ........................................... 3.5 oz
Socket ..................................................... Erie\(^c\) No.9802-000 and 9804-000, Johnson\(^d\)
Grid No.2 Bypass Capacitor ................................. Erie\(^c\) No.2943-002, Johnson\(^d\)
Base .................................................. Large-Wafer Elevenar II-Pin with Ring (JEDEC No.E11-81)

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
RADIATOR - Plate
RING - Grid-No.2
Terminal
Terminal
Terminal
Contact
Surface

(For use at higher frequencies)

THERMAL

Terminal Temperature (All Terminals) .................. 250 max \(^\circ\)C
Radiator Core Temperature ................................ See Dimensional Outline \(^{\circ}\)C
Air Flow\(^q\) (See accompanying Typical Cooling Requirements curve)
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
  - Up to 30 MHz: 3000 V
  - Up to 500 MHz: 2200 V

- DC Grid-No.2 Voltage: 400 V
- DC Grid-No.1 Voltage: -100 V
- DC Plate Current at Peak of Envelope: 450 mA
- DC Grid-No.1 Current: 100 mA
- Plate Dissipation: 400 W
- Grid-No.2 Dissipation: 8 W
- Peak Heater-Cathode Voltage: ±150 V

Typical CCS Operation at 30 MHz with "Two-Tone Modulation"

<table>
<thead>
<tr>
<th>$\text{AB}_1$</th>
<th>$\text{AB}_2$</th>
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<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>
</tbody>
</table>

- DC Plate Current
  - Peak of envelope: 335 mA
  - Average: 250 mA

- DC Grid-No.2 Current
  - Peak of envelope: 10 mA
  - Average: 7 mA

- Average DC Grid-No.1 Current: 0.05 mA

- Peak-of-Envelope Driver Power Output (Approx.): 0.3 W
- Output-Circuit Efficiency (Approx.): 90 \\
- Distortion Products Level
  - Third order: 29 dB
  - Fifth order: 32 dB

- Useful Power Output (Approx.)
  - Peak of envelope: 380 W
  - Average: 190 W

Maximum Circuit Values

- Grid-No.1 Circuit Resistance Under Any Condition:
  - With fixed bias: 25000 Ω
  - With fixed bias (in Class-AB₂ operation): 100000 Ω
  - With cathode bias: Not recommended

- Grid-No.2-Circuit Impedance
  - 10000 Ω

- Plate-Circuit Impedance:

PLATE-MODULATED RF POWER AMPLIFIER - Class C Telephony

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

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 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>
**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>Maximum Values</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>
</tbody>
</table>

**Up to 500 MHz**

<table>
<thead>
<tr>
<th></th>
<th>Maximum Values</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</td>
<td>300 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Grid-No.2 Dissipation</td>
<td>8 W</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>400 W</td>
</tr>
<tr>
<td>Peak Heater-Cathode Voltage.</td>
<td>-150 V</td>
</tr>
</tbody>
</table>

**Typical CCS Operation**

In grid-drive circuit at 50 MHz

<table>
<thead>
<tr>
<th></th>
<th>Maximum Values</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>
<tr>
<td>DC Grid-No.1 Current</td>
<td>50 40 40 30 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1.2 2 2 2 W</td>
</tr>
<tr>
<td>Useful Power Output.</td>
<td>120 175 275 375 W</td>
</tr>
</tbody>
</table>

In grid-drive circuit at 470 MHz

<table>
<thead>
<tr>
<th></th>
<th>Maximum Values</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>200 200 200 200 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-30 -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>10 10 5 5 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>30 30 30 30 mA</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>5 5 5 5 W</td>
</tr>
<tr>
<td>Useful Power Output.</td>
<td>100 165 235 300 W</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values**

<table>
<thead>
<tr>
<th></th>
<th>Maximum Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Circuit Resistance Under Any Condition</td>
<td>25000 Ω</td>
</tr>
<tr>
<td>Grid-No.2-Circuit Impedance</td>
<td>10000 Ω</td>
</tr>
<tr>
<td>Plate-Circuit Impedance</td>
<td>n</td>
</tr>
</tbody>
</table>

\(^a\) Because the cathode is subjected to back bombardment at 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) 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., 615 Best 12th Street, Erie, Pa.

\(^d\) E. F. Johnson Co., 1421 30th Ave. S.W., Waseca, Minn.

\(^e\) Mynalex 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

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Electronic Components and Devices
Harrison, N. J.
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>1</td>
<td>1.15</td>
<td>1.45</td>
</tr>
</tbody>
</table>

2. Direct Inter electrode Capacitances

| Grid No.1 to plate | 2 | -0.13 | pF |
| Grid No.1 to cathode | 2 | 14.3 | 17.7 | pF |
| Plate to cathode | 2 | 0.0065 | 0.0155 | pF |
| Grid No.1 to grid No.2 | 2 | 20.8 | 25.2 | pF |
| Grid No.2 to plate | 2 | 5.7 | 7.1 | pF |
| Grid No.2 to cathode | 2 | 2.0 | 3.0 | pF |
| Cathode to heater | 2 | 2.5 | 4.1 | pF |

3. Grid-No.1 Voltage | 1.3 | -8 | -19 | V |

4. Reverse Grid-No.1 Current | 1.3 | -25 | μA |

5. Grid-No.2 Current | 1.3 | -7 | +6 | mA |

6. Peak Emission | 1.4 | 13 | peak A |

7. Inter electrode Leakage Resistance | 5 | 50 | MΩ |

8. Zero Bias Plate Current | 1.6 | 1 | 1.8 | A |

**Note 1:** With 13.5 volts ac or dc on heater.

**Note 2:** Measured with special shield adapter.

**Note 3:** With de plate voltage at 700 volts, de grid-No.2 voltage of 250 volts, and de grid-No.1 voltage adjusted to give a de 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 90 p.p.s. The voltage-pulse amplitude is 250 volts peak. After 1 minute at this value, the current-pulse amplitude at 1 minute at this value, the current-pulse magnitude will not be less than the value specified.

**Note 5:** Under conditions with tube at 20°C to 30°C 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 no less than the value specified.

**Note 6:** With de plate voltage of 450 volts, degrid No.2 voltage of 400 volts, de grid No.1 voltage of 100 volts, grid drive voltage to zero. With pulse duration of 1500 to 5000 μs and pulse repetition frequency is 10 to 12 p.p.s.

→ Indicates a change.

**DATA 2**

**RADIO CORPORATION OF AMERICA**

Electronic Components and Devices

Harrison, N. J.
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 DIRECTED THROUGH RADIATOR WITH AIR CHIMNEY SK-606 (EITEL-McCULLOUGH INC.), AND SOCKET CD464-2 (MYCALEX CORP. OF AMERICA), AND BY-PASS CAPACITOR (E.F. JOHNSON CO.)

PLATE-CORE TEMPERATURE — 250° C.
INCOMING-AIR TEMPERATURE — 24° C.

AIR FLOW — CUBIC FEET PER MINUTE

0 1 2 3 4 5 6 7

PLATE DISSIPATION — WATTS (SOLID LINE)

0 0.2 0.4 0.6 0.8

PRESSURE DROP — INCHES OF WATER (DASHED LINE)

0 100 200 300 400

92CM-11299

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
TYPICAL PLATE CHARACTERISTICS
For Grid-No.2 Voltage = 400 Volts

HEATER VOLTS = 13.5
GRID-No.2 VOLTS = 400
GRID-No.1 VOLTS = $E_{CJ}$

PLATE AMPERES

PLATE VOLTS

92CM-11290
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 = ——

GRID-No. 1 (IC1) OR GRID-No. 2 (IC2) MILLIAMPERES

PLATE VOLTS

92CM-11293RI
TYPICAL CONSTANT-CURRENT CHARACTERISTICS

For Grid-No. 2 Voltage = 400 Volts

Ef = RATED VOLTS
GRID No. 2 VOLTS = 400
PLATE mA = \( I_b \)
GRID-No. 2 mA = \( I_{C2} \)
GRID-No. 1 mA = \( I_{C1} \)

GRID No. 1 VOLTS

92CM-13389

RADIO CORPORATION OF AMERICA
Electronic Components and Devices
Harrison, N. J.
TYPICAL CONSTANT-CURRENT CHARACTERISTICS
For Grid-No.2 Voltage = 250 Volts

E1 = RATED VOLTS
GRID No.2 VOLTS = 250
PLATE mA = Ib
GRID-No.2 mA = IC2
GRID-No.1 mA = IC1