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 ± 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.): a
Grid No.1 to plate .............. 0.6 μf
Grid No.1 to grid No.2 &
internal shield .............. 11 μf
Grid No.1 to cathode and heater ...
Grid No.2 & internal shield
to plate .................. 9.5 μf
Grid No.2 & internal shield
to cathode and heater ......... 2.0 μf
Plate to cathode and heater .... 0.2 μf

Mechanical:
Operating Position .............. Any
Maximum Overall Length ........ 5"
Seated Length .................. 4.44" ± 0.08"
Maximum Diameter .............. 2.56"
Weight (Approx.) .............. 6 oz
Bulb ................................ T20
Socket ......................... Johnson Nos.122-247b or 122-248b, 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. °C

a Indicates a change.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AF POWER AMPLIFIER & MODULATOR — Class AB₁ c

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Component</th>
<th>CCS d</th>
<th>ICAS e</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1500 max.</td>
<td>2000 max.</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max.</td>
<td>400 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT f</td>
<td>350 max.</td>
<td>350 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT f</td>
<td>300 max.</td>
<td>400 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT f</td>
<td>20 max.</td>
<td>20 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION f</td>
<td>100 max.</td>
<td>125 max.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>respect to cathode.</td>
<td>135 max.</td>
<td>135 max.</td>
</tr>
</tbody>
</table>

Typical Operation:

Values are for 2 tubes

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1500</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>400</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-65</td>
</tr>
<tr>
<td>Peak AF Grid-No.1-to-No.1 Voltage</td>
<td>120</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>60</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>400</td>
</tr>
<tr>
<td>Max.-Signal DC Grid-No.2</td>
<td>70</td>
</tr>
<tr>
<td>Effective Load Resistance</td>
<td>8700</td>
</tr>
<tr>
<td>Max.-Signal Driving Power (Approx.)</td>
<td>0</td>
</tr>
<tr>
<td>Max.-Signal Power Output (Approx.)</td>
<td>410</td>
</tr>
</tbody>
</table>

LINEAR RF POWER AMPLIFIER — Class AB₁ c
Single-Sideband Suppressed-Carrier Service

Maximum Ratings, Absolute-Maximum Values:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1500 max.</td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC PLATE CURRENT</td>
<td>350 max.</td>
</tr>
<tr>
<td>MSX.-SIGNAL PLATE INPUT</td>
<td>300 max.</td>
</tr>
<tr>
<td>MAX.-SIGNAL GRID-No.2 INPUT</td>
<td>20 max.</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>100 max.</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td></td>
</tr>
<tr>
<td>Heater negative with</td>
<td></td>
</tr>
<tr>
<td>respect to cathode.</td>
<td>135 max.</td>
</tr>
<tr>
<td>Heater positive with</td>
<td></td>
</tr>
<tr>
<td>respect to cathode.</td>
<td>135 max.</td>
</tr>
</tbody>
</table>
Typical Operation for "Single-Tone Modulation": At 60 Mc

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1500 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>-65 volts</td>
</tr>
<tr>
<td>Max.-Signal Peak RF Grid-No.1 Voltage</td>
<td>60 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>30 ma</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>200 ma</td>
</tr>
<tr>
<td>Max.-Signal Grid-No.2 Current</td>
<td>35 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>4350 ohms</td>
</tr>
<tr>
<td>Max.-Signal Driver Power</td>
<td></td>
</tr>
<tr>
<td>Output (Approx.)</td>
<td>4 watts</td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 %</td>
</tr>
<tr>
<td>Max.-Signal Useful Power</td>
<td></td>
</tr>
<tr>
<td>Output (Approx.)</td>
<td>185k watts</td>
</tr>
</tbody>
</table>

**LINEAR RF POWER AMPLIFIER — Class B**

**Single-Sideband Suppressed-Carrier Service**

**High-Mu Triode Connection**

<table>
<thead>
<tr>
<th>Maximum Ratings, Absolute-Maximum Values: Up to 60 Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
</tr>
<tr>
<td>MAX. SIGNAL DC PLATE CURRENT</td>
</tr>
<tr>
<td>MAX.-SIGNAL DC GRID CURRENT (Combined Grids No.1 &amp; No.2)</td>
</tr>
<tr>
<td>MAX.-SIGNAL PLATE INPUT</td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE</td>
</tr>
<tr>
<td>Heater negative with respect to cathode</td>
</tr>
<tr>
<td>Heater positive with respect to cathode</td>
</tr>
</tbody>
</table>

**Typical Operation: In cathode-drive circuit at 60 Mc with "Single-Tone Modulation"**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate-to-Grids No.1 &amp; No.2 Voltage</td>
<td>1350 volts</td>
</tr>
<tr>
<td>DC Grids No.1 &amp; No.2 Voltage</td>
<td>0 volts</td>
</tr>
<tr>
<td>Zero-Signal DC Plate Current</td>
<td>30 ma</td>
</tr>
<tr>
<td>Effective RF Load Resistance</td>
<td>3800 ohms</td>
</tr>
<tr>
<td>Max.-Signal DC Plate Current</td>
<td>200 ma</td>
</tr>
</tbody>
</table>

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*Indicates a change.*
Max.-Signal DC Grid Current
(Combined Grids No.1 & No.2). 140 ma
Max.-Signal Peak RF Cathode-
to-Grids-No.1 & No.2 Voltage. 50 volts
Max.-Signal Driver Power
Output (Approx.)h. 15 watts
Output-Circuit Efficiency
(Approx.). 90 %
Max.-Signal Useful Power
Output (Approx.) 160k 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:
For maximum plate voltage and maximum plate
input above 60 Mc see Rating Chart I

DC PLATE VOLTAGE 1000 max. volts
DC GRID-No.2 VOLTAGE 400 max. volts
DC GRID-No.1 VOLTAGE -300 max. volts
DC PLATE CURRENT 280 max. ma
DC GRID-No.1 CURRENT 25 max. ma
PLATE INPUT 250 max. watts
GRID-No.2 INPUT 13.5 max. watts
PLATE DISSIPATION 67 max. watts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with
respect to cathode 135 max. volts
Heater positive with
respect to cathode 135 max. volts

Typical Operation:

At 60 Mc
DC Plate Voltage 1000 volts
DC Grid-No.2 Voltage 400 volts
DC Grid-No.1 Voltage -130 volts
Peak RF Grid-No.1 Voltage 145 volts
DC Plate Current 250 ma
DC Grid-No.2 Current 20 ma
DC Grid-No.1 Current (Approx.) 5 ma
Driver Power Output (Approx.)h.r. 5 watts
Output-Circuit Efficiency (Approx.). 90 %
Useful Power Output (Approx.) 165k watts

At 175 Mc
DC Plate Voltage 700 volts
DC Grid-No.2 Voltage 400 volts
DC Grid-No.1 Voltage -130 volts
DC Plate Current 250 ma
DC Grid-No.2 Current 8 ma

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
DC Grid-No.1 Current (Approx.). 6 6 ma
Driver Power Output (Approx.) 8 8 watts
Output-Circuit Efficiency (Approx.). 85 85 %
Useful Power Output (Approx.). 105\(^k\) 135\(^k\) watts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance\(^\circ\). 30000 max. 30000 max. ohms

**RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy\(^t\)**

**RF POWER AMPLIFIER — Class C FM Telephony**

<table>
<thead>
<tr>
<th>Rating</th>
<th>CCS(^d)</th>
<th>ICAS(^e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC PLATE VOLTAGE</td>
<td>1250 max. 1500 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.2 VOLTAGE</td>
<td>400 max. 400 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.1 VOLTAGE</td>
<td>-300 max. -300 max. volts</td>
<td></td>
</tr>
<tr>
<td>DC PLATE CURRENT</td>
<td>340 max. 340 max. ma</td>
<td></td>
</tr>
<tr>
<td>DC GRID-No.1 CURRENT</td>
<td>25 max. 30 max. ma</td>
<td></td>
</tr>
<tr>
<td>PLATE INPUT</td>
<td>375 max. 500 max. watts</td>
<td></td>
</tr>
<tr>
<td>GRID-No.2 INPUT</td>
<td>20 max. 20 max. watts</td>
<td></td>
</tr>
<tr>
<td>PLATE DISSIPATION</td>
<td>100 max. 125 max. watts</td>
<td></td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode</td>
<td>135 max. 135 max. volts</td>
<td></td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE: Heater positive with respect to cathode</td>
<td>135 max. 135 max. volts</td>
<td></td>
</tr>
</tbody>
</table>

**Typical Operation:**

At 60 Mc

<table>
<thead>
<tr>
<th>Rating</th>
<th>CCS(^d)</th>
<th>ICAS(^e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>1000 1250 1500 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage(^x)</td>
<td>400 400 400 volts</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage(^x)</td>
<td>-100 -100 -100 volts</td>
<td></td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>125 120 125 volts</td>
<td></td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>330 300 330 ma</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>20 18 20 ma</td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>5 5 5 ma</td>
<td></td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>4 4 4 watts</td>
<td></td>
</tr>
<tr>
<td>Output-Circuit Efficiency (Approx.)</td>
<td>90 90 90 %</td>
<td></td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>215(^k) 255(^k) 340(^k) watts</td>
<td></td>
</tr>
</tbody>
</table>

At 175 Mc

<table>
<thead>
<tr>
<th>Rating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>665 875 1000 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage(^x)</td>
<td>400 400 400 volts</td>
</tr>
</tbody>
</table>

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\(^a\) Maximum ratings, Absolute-Maximum Values:

For maximum plate voltage and maximum plate input above 60 Mc, see Rating Chart II

\(^b\) CCS and ICAS ratings are for single unit operation only.

\(^c\) ICAS ratings are for single unit operation only.

\(^d\) CCS ratings are for single unit operation only.

\(^e\) ICAS ratings are for single unit operation only.

\(^f\) RF power amplifier ratings are for single unit operation only.

\(^g\) Telegraphy ratings are for single unit operation only.

\(^h\) FM telephony ratings are for single unit operation only.

\(^i\) Class C Telegraphy ratings are for single unit operation only.

\(^j\) Class C FM Telephony ratings are for single unit operation only.

\(^k\) Maximum Power Output ratings are for single unit operation only.

\(^l\) Telegraphy Power Output ratings are for single unit operation only.

\(^m\) FM Telephony Power Output ratings are for single unit operation only.

\(^n\) Class C Telegraphy Power Output ratings are for single unit operation only.

\(^o\) Class C FM Telephony Power Output ratings are for single unit operation only.

\(^p\) Maximum Power Output efficiency ratings are for single unit operation only.

\(^q\) Telegraphy Power Output efficiency ratings are for single unit operation only.

\(^r\) FM Telephony Power Output efficiency ratings are for single unit operation only.

\(^s\) Class C Telegraphy Power Output efficiency ratings are for single unit operation only.

\(^t\) Class C FM Telephony Power Output efficiency ratings are for single unit operation only.

\(^u\) Maximum Power Output efficiency ratings are for single unit operation only.

\(^v\) Telegraphy Power Output efficiency ratings are for single unit operation only.

\(^w\) FM Telephony Power Output efficiency ratings are for single unit operation only.

\(^x\) Class C Telegraphy Power Output efficiency ratings are for single unit operation only.

\(^y\) Class C FM Telephony Power Output efficiency ratings are for single unit operation only.
DC Grid-No.1 Voltage: -100 -100 -100 volts
DC Plate Current: 335 300 335 ma
DC Grid-No.2 Current: 8 7 8 ma
DC Grid-No.1 Current (Approx.): 5 5 5 ma
Driver Power Output (Approx.): 8 7 8 watts
Output-Circuit Efficiency (Approx.): 85 85 85%
Useful Power Output (Approx.): 130\(^k\) 170\(^k\) 215\(^k\) watts

**Maximum Circuit Values:**

Grid-No.1-Circuit Resistance\(^a\): 30000 max. ohms

---

- \(^a\) Without external shield.
- \(^b\) 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.
- \(^c\) 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 fixed supply.
- \(^h\) Obtained from a fixed supply.
- \(^j\) "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.
- \(^k\) This value of useful power is measured at load of output circuit having indicated efficiency.
- \(^m\) Grids No.1 and No.2 connected together.
- \(^n\) 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.
- \(^p\) 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 made.
- \(^q\) 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.
- \(^r\) Indicated values are for operation at 60 Mc. Less driver power output is required at frequencies below 60 Mc.
- \(^s\) When grid No.1 is driven positive the total dc grid-No.1-circuit resistance should not exceed the specified maximum value of 30,000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.
- \(^t\) 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.
- \(^u\) 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.
- \(^v\) Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.
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

$E_f = 6.3$ VOLTS
GRID–N#2 VOLTS = 300

PLATE AMPERES

PLATE VOLTS

92CM–9511

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE CONSTANT-CURRENT CHARACTERISTICS

$E_f = 6.3 \text{ VOLTS}$

$\text{GRID-No.2 VOLTS} = 400$

$I_b = \text{PLATE AMPERES}$

$I_{C1} = \text{GRID-No.1 AMPERES}$

$I_{C2} = \text{GRID-No.2 AMPERES}$
TYPICAL CHARACTERISTICS

GRID-NR1 VOLTS = E_C1
GRID-NR2 VOLTS = E_C2

GRID-NR1 (I_C1) OR GRID-NR2 (I_C2) MILLIAMPERES

PLATE VOLTS

E_C = 6.3 VOLTS

92CS-950RI

GRID-NR1 VOLTS = 400
GRID-NR2 VOLTS = E_C1

GRID-NR1 (I_C1) OR GRID-NR2 (I_C2) MILLIAMPERES

PLATE VOLTS

E_C = 6.3 VOLTS

92CS-9500RI
TYPICAL PLATE CHARACTERISTICS
Triode Connection

$E_f = 6.3$ VOLTS
GRID No.2 CONNECTED TO GRID No.1

GRID No.1 VOLTS: $E_{CI} = +10$

PLATE AMPERES

92CM-11045RI
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

GRID-No.1 VOLTS

PLATE VOLTS

92CM-11047RI
TYPICAL CHARACTERISTICS
Triode Connection

$E_t = 6.3$ VOLTS
GRID No.2 CONNECTED TO GRID No.1
$E_G = GRID - No.1$ VOLTS

GRID - No.1 AMPERES

0 200 400 600 800 1000 1200 PLATE VOLTS

92CS-11046RI