BEAM POWER TUBE

9LK

Miniature type for use as a class C radio-frequency amplifier, oscillator, and frequency-multiplier up to 175 MHz in mobile communications equipment. Outlines section, 6E; requires miniature 9-contact socket. Curves shown under type 7558 also apply to the 7551.

Heater Voltage (ac/dc) .................................................. 13.5 ±1.5 volts
Heater Current ................................................................. 0.36 ampere
Peak Heater-Cathode Voltage .............................................. ±100 max. volts
Direct Interelectrode Capacitances:
Grid No.1 to Plate ......................................................... 0.15 max. pF
Grid No.1 to Cathode, Grid No.3, Grid No.2 and Heater .......... 10 pF
Plate to Cathode, Grid No.3, Grid No.2 and Heater .................. 5.5 pF
Bulb Temperature (At hottest point on bulb surface) ............... 225 max. °C

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance—CCS or ICAS operation ............... 0.1 megohm

Class A, Amplifier

CHARACTERISTICS

Heater Voltage .............................................................. 13.5 volts
Plate Voltage ................................................................. 250 volts
Grid-No.3 ........................................................... Connected to cathode at socket
Grid-No.2 Voltage ......................................................... 250 volts
Grid-No.1 Voltage ......................................................... −18 volts
Mu-Factor, Grid No.2 to Grid No.1 ....................................... 8.7
Transconductance ........................................................... 5300 µmhos
Plate Current ................................................................. 40 mA
Grid-No.2 Current ........................................................... 3 mA

AF Power Amplifier & Modulator—Class AB,*

MAXIMUM CCS* RATINGS (Absolute-Maximum Values)

DC Plate Voltage ......................................................... 375 volts
Grid-No.3 (Suppressor Grid) .............................................. 0 volt
DC Grid-No.2 (Screen-Grid) Voltage ..................................... 300 volts
Max.-Signal DC Plate Current† ........................................... 70 mA
Max.-Signal Plate Input‡ .................................................. 21 watts
Max.-Signal Grid-No.2 Input‡ ............................................. 2 watts
Plate Dissipation‡ ........................................................... 10 watts

TYPICAL CCS PUSH-PULL OPERATION

Values are for 2 tubes

Heater Voltage .............................................................. 13.5 volts
DC Plate Voltage ........................................................... 300 volts
Grid-No.3 ........................................................... Connected to cathode at socket
DC Grid-No.2 Voltage‡ .................................................... 250 volts
DC Grid-No.1 Voltage‡ .................................................... −21 volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage .............................. 40 volts
Zero-Signal DC Plate Current ............................................ 40 mA
Max.-Signal DC Plate Current ........................................... 125 mA
Zero-Signal DC Grid-No.2 Current ....................................... 2 mA
Max.-Signal DC Grid-No.2 Current ....................................... 14 mA
Effective Load Resistance (Plate to plate) ........................... 5000 ohms
Max.-Signal Driving Power ............................................... 0 watts
Total Harmonic Distortion ................................................ 5 %
Max.-Signal Power Output (Approx.) ................................... 20.5 watts

RF Power Amplifier & Oscillator—Class C Telegraphy†
and
RF Power Amplifier—Class C FM Telephony

MAXIMUM RATINGS (Absolute-Maximum Values)

DC Plate Voltage ........................................................... Up to 175 MHz
Grid-No.3 (Suppressor Grid) ..............................................

<table>
<thead>
<tr>
<th>CCS*</th>
<th>ICAS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>375</td>
<td>375</td>
</tr>
</tbody>
</table>

volts
### TYPICAL OPERATION

**As amplifier at 175 MHz**

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>0</td>
<td>0</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>40</td>
<td>42</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>52</td>
<td>62</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>3.7</td>
<td>5.1</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)*</td>
<td>6.5</td>
<td>8.5</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 RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th></th>
<th>Up to 175 MHz</th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300</td>
<td>300</td>
<td>volts</td>
</tr>
<tr>
<td>Grid No.3 (Suppressor Grid)</td>
<td>0</td>
<td>0</td>
<td>volt</td>
</tr>
<tr>
<td>DC Grid-No.2 (Screen-Grid) Voltage</td>
<td>300</td>
<td>300</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>125</td>
<td>125</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>60</td>
<td>70</td>
<td>mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>15</td>
<td>17.5</td>
<td>watts</td>
</tr>
<tr>
<td>Plate Input</td>
<td>1.4</td>
<td>1.4</td>
<td>watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>7</td>
<td>8</td>
<td>watts</td>
</tr>
</tbody>
</table>

**As at 175 MHz**

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>0</td>
<td>0</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>40</td>
<td>42</td>
</tr>
<tr>
<td>RF Grid-No.1 Voltage</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Driver Power Output (Approx.)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Useful Power Output*</td>
<td>6.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>

### Frequency Multiplier

#### 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>375</td>
<td>375</td>
</tr>
<tr>
<td>Grid No.3 (Suppressor Grid)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DC Grid-No.2 (Screen-Grid) Voltage</td>
<td>300</td>
<td>300</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>60</td>
<td>60</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>15</td>
<td>17.5</td>
</tr>
<tr>
<td>Plate Input</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

**As doubler to 175 MHz**

<table>
<thead>
<tr>
<th></th>
<th>CCS</th>
<th>ICAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>0</td>
<td>0</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>53</td>
<td>66</td>
</tr>
<tr>
<td>RF Grid-No.1 Voltage</td>
<td>5300</td>
<td>44000</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>60</td>
<td>74</td>
</tr>
</tbody>
</table>
### TECHNICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Current</td>
<td>50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2.6 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1 mA</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.4 watt</td>
</tr>
<tr>
<td>Useful Power Output*</td>
<td>3 watts</td>
</tr>
</tbody>
</table>

As tripler to 175 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>13.5 volts</td>
</tr>
<tr>
<td>DC Plate Voltage</td>
<td>200 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>200 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage©</td>
<td>-90 -120 volts</td>
</tr>
<tr>
<td>From a grid-No.1 resistor of</td>
<td>50000 70000 ohms</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>105 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>3 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.85 mA</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.4 watt</td>
</tr>
<tr>
<td>Useful Power Output*</td>
<td>1.4 watts</td>
</tr>
</tbody>
</table>

ι 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.

† 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.

□ Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider. If a series resistor is used, it should be adjustable to obtain 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.

▲ 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, components, initial tube characteristics, and tube characteristics during life.

* Measured at load.

● 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 obtain the desired operating plate current after initial tuning adjustments are made.

★ 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-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.

### Special Ratings & Performance Data

#### HEATER-CYCLING LIFE PERFORMANCE

| Cycles of Intermittent Operation | 2000 min. cycles |

#### LOW-FREQUENCY VIBRATION PERFORMANCE

| RMS Output Voltage | 200 max. mV |

### BEAM POWER TUBE 7558

INDUSTRIAL TYPE

Miniature type for use as a class C radio-frequency amplifier, oscillator, and frequency-multiplier up to 175 MHz in mobile communications equipment. Outlines section, 6E; requires miniature 9-contact socket. This type is identical with type 7551 except for heater voltage and current. Special ratings and performance data for the 7551 do not apply to the 7558.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage</td>
<td>6.3 ±5% volts</td>
</tr>
<tr>
<td>Heater Current</td>
<td>0.8 ampere</td>
</tr>
</tbody>
</table>

**Note:** Diagram of 7558 type not provided in the text.
7581A BEAM POWER TUBE

Glass octal type used in af power-amplifier applications. Outlines section, 19D; requires octal socket. For typical operation as push-pull class A₁, class AB₁, and class AB₂ amplifier, refer to type 6L6GC. This tube, like other power-handling tubes, should be adequately ventilated. Heater: volts (ac/dc), 6.3; amperes, 0.9; maximum heater-cathode volts, ±200.

**Class A₁ Amplifier**

**MAXIMUM RATINGS (Design-Maximum Values)**

<table>
<thead>
<tr>
<th>Connection</th>
<th>Plate Voltage</th>
<th>Grid-No.2 (Screen-Grid) Voltage</th>
<th>Plate Dissipation</th>
<th>Grid-No.2 Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triode</td>
<td>450 volts</td>
<td>500 volts</td>
<td>35 watts</td>
<td>5 watts</td>
</tr>
<tr>
<td>Pentode</td>
<td>450 volts</td>
<td>450 volts</td>
<td>35 watts</td>
<td>5 watts</td>
</tr>
</tbody>
</table>

**MAXIMUM CIRCUIT VALUES**

| Connection | Grid-No.1-Circuit Resistance: |
|------------|------------------|-------------------------------|
| For fixed-bias operation | 0.1 megalohm | 0.1 megalohm |
| For cathode-bias operation | 0.5 megalohm | 0.5 megalohm |

**Class A₁ Amplifier (Pentode Connection)**

**TYPICAL OPERATION**

<table>
<thead>
<tr>
<th>Connection</th>
<th>Plate Voltage</th>
<th>Grid-No.2 Voltage</th>
<th>Grid-No.1 Voltage</th>
<th>Transconductance</th>
<th>Plate Resistance (Approx.)</th>
<th>Grid-No.2 Current</th>
<th>Load Resistance</th>
<th>Total Harmonic Distortion</th>
<th>Maximum-Signal Power Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentode</td>
<td>70 volts</td>
<td>250 volts</td>
<td>250 volts</td>
<td>22500 ohms</td>
<td>6900 μmhos</td>
<td>72 mA</td>
<td>2500 ohms</td>
<td>10 per cent</td>
<td>6.5 watts</td>
</tr>
</tbody>
</table>

**Class A₁ Amplifier (Triode Connection)**

**MAXIMUM RATINGS (Same as for Class A₁ Amplifier)**

**TYPICAL OPERATION**

<table>
<thead>
<tr>
<th>Connection</th>
<th>Plate Voltage</th>
<th>Grid-No.1 Voltage</th>
<th>Peak AF Grid-No.1 Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pentode</td>
<td>250 volts</td>
<td>-20 volts</td>
<td>20 volts</td>
</tr>
<tr>
<td>Triode</td>
<td>250 volts</td>
<td>-20 volts</td>
<td>20 volts</td>
</tr>
</tbody>
</table>
Amplification Factor .................................................. 8
Plate Resistance (Approx.) ....................................... 1700 ohms
Transconductance .................................................. 4700 µhos
Zero-Signal Plate Current ........................................ 40 mA
Maximum-Signal Plate Current ................................... 44 mA
Load Resistance .................................................... 5000 ohms
Total Harmonic Distortion (Approx.) ........................... 5 per cent
Maximum-Signal Power Output .................................... 1.4 watts

* Grid No.2 connected to plate.
# In push-pull circuits where grid No.2 of each tube is connected to a tap on the plate
winding of the output transformer, this maximum rating is 500 volts.
▲ Applied for short interval (2 seconds) so as not to damage tube.

MEDIUM-MU TRIODE

7586
INDUSTRIAL TYPE

Nuvistor type, medium-mu general purpose triode for use as an amplifier or oscillator at frequencies extending into the UHF region. Outlines section, 1; requires nuvisor socket.

Heater Voltage (ac/dc) .............................................. 6.3 ±0.6 volts
Heater Current ..................................................... 0.135 ampere
Peak Heater-Cathode Voltage .................................... ±100 max. volts
Direct Inter-electrode Capacitance (Approx.) :
 Grid to Plate ...................................................... 2.2 pF
 Grid to Cathode, Heater, and Shell ......................... 4.2 pF
 Plate to Cathode, Heater, and Shell ......................... 1.6 pF
 Plate to Cathode ................................................ 0.26 pF
 Heater to Cathode .............................................. 1.4 pF

Industrial Service

MAXIMUM RATINGS (Absolute-Maximum Values)

For operation at any altitude
Plate Supply Voltage ............................................... 330 volts
Plate Voltage ....................................................... 110 volts
Grid Voltage:
 Negative-bias value ........................................... 55 volts
 Peak-positive value ............................................. 4 volts
Grid Current ....................................................... 2 mA
Cathode Current .................................................. 15 mA
Plate Dissipation ................................................... 1 watt

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:
 For fixed-bias operation ........................................ 0.5 megohm
 For cathode-bias operation .................................... 1 megohm

• For operation at metal-shell temperature of 150°C. For operation at other metal-shell temperatures, see Grid-Circuit Resistance Rating Chart.

Class A, Amplifier

CHARACTERISTICS
Plate Supply Voltage ............................................... 75 volts
Plate Voltage ...................................................... 26.5 volts
Grid Supply Voltage ............................................... 40 volts
Cathode Resistor .................................................. 90 ohms
Amplification Factor ............................................... 31
Grid Resistor ...................................................... 100 ohms
Plate Resistance (Approx.) ...................................... 4400 3000 3000 ohms
Transconductance .................................................. 4400 3000 3000 µhos
Plate Current ....................................................... 2.8 7.5 10.5 mA
Grid Voltage (Approx.) for plate µA = 10 ..................... — — 7 volts
Special Ratings & Performance Data

SHOCK RATING
Peak Impact Acceleration ........................................ 1000 max.  g

FATIGUE RATING
Peak Vibrational Acceleration ................................. 2.5 max.  g

GRID-CIRCUIT-RESISTANCE RATING CHART

7587 INDUSTRIAL TYPE

SHARP-CUTOFF TETRODE

Nuvistor type sharp-cutoff general-purpose tetrode for use in a wide variety of industrial applications. Outlines section, 1A1; requires nuvisor socket.

Heater Voltage (ac/dc) ........................................ 6.3 ± 0.6  volts
Heater Current .................................................. 0.150  ampere
Peak Heater-Cathode Voltage ................................. ±100 max.  volts
Direct Interelectrode Capacitances:
- Grid No.1 to Plate ........................................... 0.015 max.  pF
- Grid No.1 to Cathode, Grid No.2, Shell, and Heater. 7.0  pF
- Plate to Cathode, Grid No.2, Shell, and Heater ...... 1.4  pF
- Heater to Cathode ............................................ 1.4  pF

Industrial Service

MAXIMUM RATINGS (Absolute-Maximum Values)
For operation at any altitude

Plate Supply Voltage .......................................... 330  volts
Plate Voltage ..................................................... 250  volts
Grid-No.2 (Screen-Grid) Supply Voltage .................... 330  volts
Grid-No.2 Voltage .............................................. 110  volts
Grid-No.1 (Control-Grid) Voltage:
  Negative-bias value ....................................... 55  volts
  Peak-positive value ................................. 2  volts
Cathode Current .................................................. 20  mA
Grid-No.1 Current ................................................ 2  mA
Grid-No.2 Input ................................................... 0.2  watt
Plate Dissipation ................................................. 2.2  watts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:
  For fixed-bias operation .................................. 0.5  megohm
  For cathode-bias operation .............................. 1  megohm

* For operation at metal-shell temperature up to 150°C.
**CHARACTERISTICS**

- Plate Supply Voltage: 125 volts
- Grid-No.2 Supply Voltage: 50 volts
- Cathode Resistor: 68 ohms
- Plate Resistance (Approx.): 0.2 megohm
- Transconductance: 10600 \( \mu \)hos
- Plate Current: 10 mA
- Grid-No.2 Current: 2.7 mA
- Grid-No.1 Voltage (Approx.) for plate \( \mu A = 10 \): -4.5 volts

**SHOCK RATING**

Impact Acceleration: 1000 max. \( \times \)

**FATIGUE RATING**

Vibrational Acceleration: 2.5 max. \( \times \)

Refer to chart at end of section.

**POWER PENTODE**

**7591A**

Glass octal type used as audio-frequency power-output tube in high-quality audio applications. Outlines section, 13D; requires octal socket. Heater: volts (ac/dc), 6.3; amperes, 0.8; maximum heater-cathode volts, \( \pm 200 \) peak, 100 average.

**Class A, Amplifier**

**MAXIMUM RATINGS** (Design-Maximum Values)

- Plate Voltage: 550 volts
- Grid-No.2 (Screen-Grid) Voltage: 440 volts
- Cathode Current: 90 mA
- Plate Dissipation: 19 watts
- Grid-No.2 Input: 3.3* watts

**TYPICAL OPERATION AND CHARACTERISTICS**

- Plate Voltage: 300 volts
- Grid-No.2 Voltage: 300 volts
- Grid-No.1 (Control-Grid) Voltage: -10 volts
- Peak AF Grid-No.1 Voltage: 10 volts
- Zero-Signal Plate Current: 60 mA
- Maximum-Signal Plate Current: 75 mA
- Zero-Signal Grid-No.2 Current: 8 mA
Maximum-Signal Grid-No.2 Current .................................................. 15 mA
Triode Amplification Factor .......................... 16.8
Plate Resistance (Approx.) .......................... 29000 ohms
Transconductance .......................... 10200 μhms
Load Resistance .......................... 5000 ohms
Total Harmonic Distortion .......................... 13 per cent
Maximum-Signal Power Output .......................... 11 watts

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:
For fixed-bias operation ....................................... 0.3 megohm
For cathode-bias operation ................................... 1 megohm

* Grid-No.2 input may reach 6 watts during peak levels of speech and music signals.
* Triode connection, grid No.2 connected to plate.

Push-Pull Class AB₁ Amplifier

MAXIMUM RATINGS (Same as for Class A₁ Amplifier)

TYPICAL OPERATION (Values are for two tubes) Fixed Bias Cathode Bias

Plate Supply Voltage ......................................... 350 450 450 volts
Grid-No.2 Supply Voltage ......................................... 350 400 400 volts
Grid-No.1 Supply Voltage .......................................... 16.5 21 volts
Cathode-Bias Resistor
(Common to both cathodes) .................................. — 200 ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage .............. 31 42 28 volts
Zero-Signal Plate Current ..................................... 92 66 82 mA
Maximum-Signal Plate Current .................................. 130 144 94 mA
Zero-Signal Grid-No.2 Current .................................. 13 9.4 11.5 mA
Maximum-Signal Grid-No.2 Current .................. 28.6 30 22 mA
Effective Load Resistance (Plate-to-plate) .......... 6600 6600 9000 ohms
Total Harmonic Distortion ..................................... 2 1.5 2 per cent
Maximum-Signal Power Output .......................... 30 45 28 watts

7695 Refer to chart at end of section.
7717/6CY5 Refer to chart at end of section.
7724/14GT8 Refer to chart at end of section.
7788 Refer to chart at end of section.

POWER PENTODE

Novar type used in output stages of high-fidelity audio amplifiers and radio receivers. Outlines section, 11C or 30D; requires novar 9-contact socket. This tube, like other power-handling tubes, should be adequately ventilated.

Heater Voltage (ac/dc) ........................................ 6.3 volts
Heater Current ........................................ 0.8 ampere
Heater-Cathode Voltage:
Peak value ........................................ ±200 max volts
Average value ........................................ 100 max volts
Direct Inter electrode Capacitances (Approx.) :
Grid No.1 to Plate ........................................ 0.15 pF
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 ........................................ 11 pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3 ........................................ 4.4 pF

Class A₁ Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage ........................................ 550 volts
Grid-No.2 (Screen-Gird) Voltage .............. 440 volts
Average Cathode Current ................................... 90 mA
Plate Dissipation ........................................ 19 watts
Grid-No.2 Input ........................................ 3.3 watts
Bulb Temperature (At hottest point) .......... 240 °C
### TYPICAL OPERATION AND CHARACTERISTICS

- **Plate Supply Voltage**: 300 volts
- **Grid-No.2 Voltage**: 300 volts
- **Grid-No.1 (Control-Grid) Voltage**: -10 volts
- **Peak AF Grid-No.1 Voltage**: 10 volts
- **Zero-Signal Plate Current**: 60 mA
- **Maximum-Signal Plate Current**: 75 mA
- **Zero-Signal Grid-No.2 Current**: 8 mA
- **Maximum-Signal Grid-No.2 Current**: 15 mA
- **Plate Resistance (Approx.)**: 29000 ohms
- **Transconductance**: 10200 μmhos
- **Effective Load Resistance**: 3000 ohms
- **Total Harmonic Distortion**: 15 per cent
- **Maximum-Signal Power Output**: 11 watts

### MAXIMUM CIRCUIT VALUES

Grid-No.1 Circuit Resistance:
- For fixed-bias operation: 0.3 megarhms
- For cathode-bias operation: 1 megarhms

- In push-pull circuits where the grid No.2 of each tube is connected to a tap on the plate winding of the output transformer, this maximum rating is 440 volts.
- Grid No.2 input may reach 6 watts during peak levels of speech and music signals.

### Push-Pull Class AB₁, Amplifier

### MAXIMUM RATINGS (Same as for class A₁ amplifier)

#### TYPICAL OPERATION (Values are for two tubes)

<table>
<thead>
<tr>
<th></th>
<th>Fixed Bias</th>
<th>Cathode Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plate Supply Voltage</strong></td>
<td>300 350</td>
<td>400 450 450</td>
</tr>
<tr>
<td><strong>Grid-No.2 Supply Voltage</strong></td>
<td>300 350</td>
<td>350 350 400</td>
</tr>
<tr>
<td><strong>Grid-No.1 Voltage</strong></td>
<td>-12.5 -15.5</td>
<td>-16 -15.5 -21</td>
</tr>
<tr>
<td><strong>Cathode-Bias Resistor (Common to both cathodes)</strong></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Peak AF Grid-No.1-to-Grid-No.1 Voltage</strong></td>
<td>25 31</td>
<td>32 33 42</td>
</tr>
<tr>
<td><strong>Zero-Signal Plate Current</strong></td>
<td>14 72</td>
<td>64 60 40</td>
</tr>
<tr>
<td><strong>Maximum-Signal Plate Current</strong></td>
<td>116 130</td>
<td>135 142 145</td>
</tr>
<tr>
<td><strong>Zero-Signal Grid-No.2 Current</strong></td>
<td>10 9.5</td>
<td>8 7.2 5</td>
</tr>
<tr>
<td><strong>Maximum-Signal Grid-No.2 Current</strong></td>
<td>-28 32</td>
<td>28 30 29</td>
</tr>
<tr>
<td><strong>Effective Load Resistance</strong> (Plate-to-plate)</td>
<td>6600 6600</td>
<td>6600 6600 6600</td>
</tr>
<tr>
<td><strong>Total Harmonic Distortion</strong></td>
<td>5 2.5 2</td>
<td>2.5 2 2 per cent</td>
</tr>
<tr>
<td><strong>Maximum-Signal Power Output</strong></td>
<td>14 30</td>
<td>34 38 44 28</td>
</tr>
</tbody>
</table>

### Push-Pull Class AB₁, Amplifier

Grid No.2 of Each Tube Connected to Tap on Plate Winding of Output Transformer

### MAXIMUM RATINGS (Same as for class A₁ amplifier)

#### TYPICAL OPERATION (Values are for two tubes)

<table>
<thead>
<tr>
<th></th>
<th>Fixed Bias</th>
<th>Cathode Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plate Supply Voltage</strong></td>
<td>400 425</td>
<td>400 425</td>
</tr>
<tr>
<td><strong>Grid-No.2 Supply Voltage</strong></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Grid-No.1 Voltage</strong></td>
<td>-20.5</td>
<td>-</td>
</tr>
<tr>
<td><strong>Cathode-Bias Resistor (Common to both cathodes)</strong></td>
<td>-</td>
<td>185</td>
</tr>
</tbody>
</table>

*Maximum ratings for push-pull amplifiers are typically different from those of single-ended amplifiers due to the additional power and circuit requirements.
Peak AF Grid-No.1-to-Grid-No.1 Voltage ....................... 41 42 volts
Zero-Signal Plate Current .................................. 60 88 mA
Maximum-Signal Plate Current ................................ 115 100 mA
Zero-Signal Grid-No.2 Current ................................ 8 12 mA
Maximum-Signal Grid-No.2 Current ......................... 18 16 mA
Effective Load Resistance (Plate-to-plate) .............. 6600 6600 ohms
Total Harmonic Distortion .................................... 2.5 3.5 per cent
Maximum-Signal Power Output .................................. 23 21 watts

* Grid No.2 supply voltage is obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to apply 50 per cent of the plate signal voltage to the grid No.2 of each output tube.

7895 INDUSTRIAL TYPE

HIGH-MU TRIODE

Nuvistor type high-mu triode for use in a wide variety of industrial applications. Outlines section, 1; requires nuvistor socket.

Heater Voltage (ac/dc) ...................................... 6.3 ±10% volts
Heater Current ............................................. 0.135 amperes
Peak Heater-Cathode Voltage ................................ 0 ±100 max. volts
Direct Interelectrode Capacitances (Approx.):
Grid to Plate .................................................. 0.2 pF
Grid to Cathode, Shell, and Heater ....................... 4.2 pF
Plate to Cathode, Shell, and Heater ...................... 1.7 pF
Plate to Cathode ........................................... 0.22 pF
Heater to Cathode .......................................... 1.3 pF

Industrial Service

MAXIMUM RATINGS (Absolute-Maximum Values)

For operation at any altitude

Plate Supply Voltage ......................................... 330 volts
Plate Voltage .................................................. 110 volts
Grid Voltage:
  Negative-bias value ..................................... 55 volts
  Peak-positive value ...................................... 2 volts
Grid Current ................................................. 2 mA
Plate Current ................................................. 20 mA
Cathode Current ............................................. 15 mA
Plate Dissipation ........................................... 1 watt

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:* For fixed-bias operation .......... 0.5 megohm
  For cathode-bias operation ................................ 1 megohm

* For operation at metal-shell temperature up to 150°C.

Class A1 Amplifier

CHARACTERISTICS

Plate Supply Voltage ......................................... 110 volts
Grid Supply Voltage .......................................... 0 volts
Cathode Resistor ............................................. 150 ohms
Amplification Factor .......................................... 64
Plate Resistance (Approx.) .................................. 6800 ohms
Transconductance ............................................ 9400 μmhos
Plate Current ................................................. 7 mA
Grid Voltage (Approx.) for plate μA = 10 ............... —4 volts

Special Ratings & Performance Data

SHOCK RATING

Impact Acceleration .......................................... 1000 max.  g

FATIGUE RATING

Vibrational Acceleration .................................... 2.5 max.  g
Refer to chart at end of section.

BEAM POWER TUBE

Miniature quick-heating-filament beam power tube for use as an RF oscillator, amplifier and frequency multiplier in mobile communications equipment. Outlines section, 6E; requires miniature 9-contact socket.

9PB

Operating Position
Vertical, base up or down, or Horizontal

with pins 2 and 8 in vertical plane

Filament Voltage

Filament Current

Heating Time

Direct Interelectrode Capacitances:

Grid No.1 to Plate

Grid No.1 to Filament, Grid No.3, and Grid No.2

Plate to Filament, Grid No.3, and Grid No.2

Bulb Temperature (At hottest point on bulb surface)

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance

Class A1 Amplifier

CHARACTERISTICS

Plate Voltage

Grid No.3

Grid-No.2 Voltage

Grid-No.1 Voltage

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

Transconductance

Plate Current

Grid-No.2 Current

RF Power Amplifier & Oscillator—Class C Telegraphy

RF Power Amplifier—Class C FM Telephony

MAXIMUM ICAS\textsuperscript{b} RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th>DC Plate Voltage</th>
<th>Up to 175 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to pin 1 at socket</td>
<td></td>
</tr>
<tr>
<td>300 volts</td>
<td></td>
</tr>
<tr>
<td>300 volts</td>
<td></td>
</tr>
<tr>
<td>250 volts</td>
<td></td>
</tr>
<tr>
<td>125 volts</td>
<td></td>
</tr>
<tr>
<td>60 mA</td>
<td></td>
</tr>
<tr>
<td>10 mA</td>
<td></td>
</tr>
</tbody>
</table>
### TYPICAL ICAS b OPERATION c

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DC Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300</td>
<td>300 volts</td>
</tr>
<tr>
<td>DC Grid-No.3 Voltage</td>
<td>160</td>
<td>185 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-36</td>
<td>-39 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>41</td>
<td>43 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50</td>
<td>60 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2.5</td>
<td>4 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2</td>
<td>2.2 mA</td>
</tr>
<tr>
<td>Driving Power f (Approx.)</td>
<td>1</td>
<td>1 watt</td>
</tr>
<tr>
<td>Useful Power Output g (Approx.)</td>
<td>5.5</td>
<td>7 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 ICAS b RATINGS (Absolute-Maximum Values)

#### Up to 175 MHz
<table>
<thead>
<tr>
<th>Parameter</th>
<th>DC Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>-125</td>
<td>-125 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>60</td>
<td>60 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10</td>
<td>10 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>15</td>
<td>15 watts</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>1.4</td>
<td>1.4 watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>7</td>
<td>7 watts</td>
</tr>
</tbody>
</table>

#### At 175 MHz
<table>
<thead>
<tr>
<th>Parameter</th>
<th>DC Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>-70</td>
<td>-70 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>60</td>
<td>60 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2.5</td>
<td>2.5 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>2.1</td>
<td>2.1 mA</td>
</tr>
<tr>
<td>Driving Power f (Approx.)</td>
<td>1</td>
<td>1 watt</td>
</tr>
<tr>
<td>Useful Power Output g (Approx.)</td>
<td>6.5</td>
<td>6.5 watts</td>
</tr>
</tbody>
</table>

### Frequency Multiplier

#### MAXIMUM ICAS b RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>DC Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300</td>
<td>300 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>300</td>
<td>300 volts</td>
</tr>
<tr>
<td>DC Grid-No.2 Supply Voltage</td>
<td>250</td>
<td>250 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-125</td>
<td>-125 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50</td>
<td>50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>10</td>
<td>10 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current</td>
<td>5</td>
<td>5 mA</td>
</tr>
<tr>
<td>Grid-No.2 Input</td>
<td>15</td>
<td>15 watts</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>1.5</td>
<td>1.5 watts</td>
</tr>
</tbody>
</table>

### TYPICAL ICAS b OPERATION c

#### As doubler to 175 MHz
<table>
<thead>
<tr>
<th>Parameter</th>
<th>DC Value</th>
<th>Maximum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>300 volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>200</td>
<td>215 volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-53</td>
<td>-80 volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>60</td>
<td>87 volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>45</td>
<td>50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>3.8</td>
<td>3.8 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Driving Power f (Approx.)</td>
<td>0.4</td>
<td>0.5 watt</td>
</tr>
<tr>
<td>Useful Power Output g (Approx.)</td>
<td>2.5</td>
<td>3.5 watts</td>
</tr>
</tbody>
</table>
As tripler to 175 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>250</td>
<td>250</td>
<td>volts</td>
</tr>
<tr>
<td>Grid No.3</td>
<td>Connected to pin 1 at socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage&lt;sup&gt;a&lt;/sup&gt;</td>
<td>180</td>
<td>225</td>
<td>volts</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage&lt;sup&gt;f&lt;/sup&gt; from a grid-No.1 resistor of: 50,000 ohms</td>
<td>—90</td>
<td>—</td>
<td>volts</td>
</tr>
<tr>
<td>60,000 ohms</td>
<td>—</td>
<td>108</td>
<td>volts</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>105</td>
<td>118</td>
<td>volts</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>2.5</td>
<td>3.4</td>
<td>mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.8</td>
<td>1.8</td>
<td>mA</td>
</tr>
<tr>
<td>Driving Power&lt;sup&gt;f&lt;/sup&gt; (Approx.)</td>
<td>0.4</td>
<td>0.6</td>
<td>watt</td>
</tr>
<tr>
<td>Useful Power Output&lt;sup&gt;g&lt;/sup&gt; (Approx.)</td>
<td>1.4</td>
<td>2</td>
<td>watts</td>
</tr>
</tbody>
</table>

<sup>a</sup> 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.

<sup>b</sup> Intermittent Commercial and Amateur Service.

<sup>c</sup> Pins 4 and 5 at rf ground.

<sup>d</sup> Obtained preferably from a separate source or from the plate-voltage supply with a 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.

<sup>e</sup> Obtained from a grid-No.1 resistor, or from a combination of grid-No.1 resistor and 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.

<sup>f</sup> Driving power includes circuit losses and is the actual power measured at the input to the grid circuit.

<sup>g</sup> Measured at load.

<sup>h</sup> 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.

---

**TYPE 7905**

GRID-No.2 VOLT =185

GRID-No.1 VOLT =15

GRID-No.1 VOLT =0

**PLATE MILLIAMPERES (I<sub>p</sub>)**

0 | 100 | 200 | 300 | 400
--- | --- | --- | --- | ---

**GRID VOLTS**

0 | 5 | 10 | 15 | 20 | 25 | 30
--- | --- | --- | --- | --- | --- | ---

**PLATE VOLTS**

0 | 100 | 200 | 300 | 400
--- | --- | --- | --- | ---

**NUTO 1917 BT**

**MEDIUM-MU TRIODE**

Nuvistor type, medium-mu triode for use in low voltage industrial applications. Outlines section, 1; requires nuvisor socket.

**8056**

**INDUSTRIAL TYPE**

Heater Voltage (ac/dc) | 6.3 ± 0.6 | volts |
Heater Current | 0.135 | ampere |
Peak Heater-Cathode Voltage | 100 | volts |
Direct Inter-electrode Capacitances (Approx.):

- Grid to Plate: 2.1 pF
- Grid to Cathode, Shell, and Heater: 4.0 pF
- Plate to Cathode, Shell, and Heater: 1.7 pF
- Plate to Cathode: 0.84 pF
- Heater to Cathode: 1.4 pF

Industrial Service

**MAXIMUM RATINGS** (Absolute-Maximum Values)

For operation at any altitude:

- Plate Voltage: 50 volts
- Grid Voltage:
  - Negative-bias value: 55 volts
  - Peak-positive value: 2 volts
- Grid Current: 2 mA
- Cathode Current: 15 mA
- Plate Dissipation: 0.45 watt

**TYPICAL OPERATION**

- Plate Supply Voltage: 12 volts
- Grid Supply Voltage: 24 volts
- Grid Resistor: 3300 ohms
- Amplification Factor: 12
- Plate Resistance (Approx.): 1500 ohms
- Transconductance: 8000 μmhos
- Plate Current: 5.5 mA

**MAXIMUM CIRCUIT VALUES**

- Grid-Circuit Resistance:*
  - For fixed-bias operation: 10 megarhms
  - For cathode-bias operation: 10 megarhms

*For operation at metal-shell temperatures up to 150°C. For operation at other metal-shell temperatures, see Grid-Circuit Resistance Rating Chart.

**Class A₁ Amplifier**

**CHARACTERISTICS**

- Plate Supply Voltage: 24 volts
- Grid: Connected to negative end of cathode resistor
- Cathode Resistor: 100 ohms
- Amplification Factor: 11.5
- Plate Resistance (Approx.): 1580 ohms
- Transconductance: 7500 μmhos
- Plate Current: 8.7 mA
- Grid Voltage (Approx.) for plate μA = 50: 5 volts

**SHOCK RATING**

Impact Acceleration: 1000 max. g

**FATIGUE RATING**

Vibrational Acceleration: 2.5 max. g

---

**GRID-CIRCUIT RESISTANCE RATING CHART**

- Type 8056
- Cathode bias or fixed bias

---

[Graphs and charts are not transcribed here.]

---

**GRID VOTLS, E=0, 2.5, 3.0**

- Plate Volts: 92C5-14697T1
- Plate Milliamperes: 15

---

**MAXIMUM GRID-CIRCUIT RESISTANCE - MEGOHMS**

- Metal-shell Temperature: 250°C
- Graph shows resistance values.