2050
INDUSTRIAL
TYPE
GAS THYRATRON
Glass octal type gas tetrode thyatron for use in relay and grid-controlled-rectifier service. Outlines section, 22; requires octal socket. For maximum ratings and typical operating conditions refer to type 2050A.

Heater Voltage (ac/dc) .......................... 6.3 ±10% volts
Heater Current ......................... 6.5 6.3 6.9 volts
Heater Current ......................... 0.54 0.60 0.66 amperes
Cathode:
Heating Time, prior to tube conduction .................. 10 sec
Direct Interelectrode Capacitances (Approx.):
Grid No. 1 to Anode ......................... 0.26 pF
Input .......................... 4.2 pF
Output .......................... 3.6 pF

2050A
INDUSTRIAL
TYPE
GAS THYRATRON
Glass octal type gas tetrode thyatron for use in relay and grid-controlled-rectifier service. Outlines section, 13C; requires octal socket.

Heater Voltage (ac/dc) ......................... 6.3 ±10% volts
Heater Current ......................... 0.6 amperes
Peak Heater-Cathode Voltage:
Heater negative with respect to cathode .................. 100 max volts
Heater positive with respect to cathode .................. 25 max volts
Cathode:
Minimum heating time prior to tube conduction .................. 10 seconds
Direct Interelectrode Capacitances (Approx.):
Grid No. 1 to anode ......................... 0.15 pF
Grid No. 1 to cathode and grid No. 2 .................. 2.2 pF
Ionization Time (Approx.):
For dc anode volts = 100, grid-No. 1 volts (square-wave pulse) = 50, peak anode amperes during conduction = 1
Deionization Time (Approx.):
With dc anode volts = 125, grid-No. 1 volts = −250, grid-No. 1 resistor (ohms) = 1000, dc anode amperes = 0.1
Maximum Critical Grid-No. 1 Current for dc anode supply volts
Average = 460, average anode amperes = 0.1
Anode Voltage Drop (Approx.):
Grid-No. 1 Control Ratio (Approx.) for grid-No. 1 resistor (ohms) = 0, grid-No. 2 connected to cathode at socket
Grid-No. 2 Control Ratio (Approx.) for grid-No. 1 resistor (ohms) = 0, grid-No. 1 connected to cathode at socket
Relay and Grid-Controlled Rectifier Service
For anode supply frequency of 60 Hz

MAXIMUM RATINGS (Absolute-Maximum Values)

Peak Anode Voltage:
For Forward .......................... 180 650 volts
Inverse .......................... 360 1300 volts
Grid-No. 2 (Shield-Grid) Voltage:
Peak, before tube conduction .................. −100 −100 volts
Average*, during tube conduction .................. −10 −10 volts
Grid-No. 1 (Control-Grid) Voltage:
Peak, before tube conduction .................. −250 −250 volts
Average*, during tube conduction .................. −10 −10 volts
Cathode Current:
Peak ......................... 1 1 amperes
Average* ......................... 0.2 0.1 amperes
Fault, for duration of 0.1 second maximum .................. 10 10 amperes
Grid-No. 2 Current:
Average* +0.01 +0.01 ampere
Grid-No. 1 Current:
Average* -0.01 -0.01 ampere
Ambient-Temperature Range -75 to +90 °C

TYPICAL OPERATION FOR RELAY SERVICE
RMS Anode Voltage 117 400 volts
Grid No. 2 Connected to cathode at socket
RMS Grid-No. 1 Bias Voltage 5 volts
DC Grid-No. 1 Voltage -- 6 volts
Peak Grid-No. 1 Signal Voltage 5 6 volts
Grid-No. 1 Circuit Resistance 1 1 megohms
Anode-Circuit Resistance† 1200 2000 ohms

MAXIMUM CIRCUIT VALUES
Grid-No. 1-Circuit Resistance:
For average anode current below 0.1 ampere 10 megohms
For average anode current above 0.1 ampere 2 megohms

* Averaged over any interval of 30 seconds maximum.
△ Approximately 180° out of phase with the anode voltage.
† Sufficient resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings.

Operating Considerations

The heater is designed to operate on either ac or dc at 6.3 volts. Regardless of the heater-voltage supply used the heater voltage must never be allowed to deviate from its rated range. Heater operation outside of this voltage range will impair tube performance and may cause tube failure. Low heater voltage causes low cathode temperature with resultant cathode sputtering and consequent destruction of the cathode; high heater voltage causes high cathode temperature with resultant heating of the grid and consequent grid emission which produces unpredictable shifts in the critical grid-No. 1 voltage for conduction.

The cathode should be allowed to reach normal operating temperature before anode current is drawn. The delay period should not be less than 10 seconds after application of heater voltage. Unless this recommendation is followed, the cathode will be damaged.

![Operating Range Diagram](image)

The shield grid (grid No. 2) is normally connected to the cathode at socket. It may, however, be used as a control electrode because the control characteristic of grid No. 1 may be shifted by varying the potential of grid
No. 2. As grid No. 2 is made negative, the grid-No. 1 characteristic is shifted in the positive direction. The use of grid No. 2 as the control electrode (with grid No. 1 connected to cathode at socket) has the advantage of increased sensitivity but consideration must be given to the higher preconduction current, higher capacitance to anode, and less stability of operation.

A grid-No. 1 resistor having a value as high as 10 megohms to give circuit sensitivity can be used with the 2050-A because its control-grid current is very low. However, when a high value of grid resistor is used, care should be taken to keep the tube base and socket clean and dry in order to make the effect of leakage currents between the control-grid base pin and anode base pin very small.

Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings of the tube.

### 2076/5R4GB
Refer to chart at end of section.
For replacement use type 2076/5R4GB.

### 2076/5R4GYB
Refer to chart at end of section.

### 2081/6AW8A
Refer to chart at end of section.

### 2082/12AY7
Refer to chart at end of section.

### 5636
Refer to chart at end of section.

### 5639
Refer to chart at end of section.

### 5642
Refer to chart at end of section.

---

### 5651A
**VOLTAGE-REFERENCE TUBE**

Miniature type cold-cathode, glow-discharge voltage-reference tube for use in dc power supplies. Outlines section, 5C; requires miniature 7-contact socket.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Operating Current (Continuous)</td>
<td></td>
<td>107</td>
<td>115*</td>
</tr>
<tr>
<td>DC Operating Current (Continuous)</td>
<td></td>
<td>1.5</td>
<td>mA</td>
</tr>
<tr>
<td>Ambient Temperature Range</td>
<td></td>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td><strong>Volts</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature coefficient of Operating Voltage (over ambient temperature range of —55 to 90°C)</strong></td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>mV/°C</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Percentage Variation of Operating Voltage</strong></td>
<td>—</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td><strong>During first 300 hours of life</strong></td>
<td></td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>During subsequent 1000 hours of life</strong></td>
<td>—</td>
<td>—</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Percentage Variation of Operating Voltage after first 300 hours of life</strong></td>
<td>—</td>
<td>—</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Instantaneous Voltage Fluctuation (Voltage jump)</strong></td>
<td>—</td>
<td>—</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**CIRCUIT VALUES**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shunt Capacitor</td>
<td>—</td>
</tr>
<tr>
<td>Series Resistor</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*"*
Installation and Application

Make no connection to pins 3 and 6. Any potentials applied to these pins may cause erratic tube performance. The three pin terminals for the cathode (pins 2, 4, and 7) and the two for the anode (pins 1 and 5) offer the equipment designer several different possibilities for connection of the 5651A. Any pair of interconnected pins can be used as a jumper connection to a circuit common to either the cathode or to the anode. The use of such a jumper connection provides a means for opening the circuit to protect circuit components when the 5651A is removed from its socket. Under no circumstances should the current through any pair of interconnected pins exceed one ampere.

If the load for the regulated power supply is disconnected either directly or by removing the 5651A from its socket, the rectifier capacitors will charge to the rectifier peak voltage. It is important, therefore, that these capacitors be rated to withstand such voltage.

A warm-up period of 3 minutes should be allowed each time the equipment is turned on to insure minimum voltage drift of the 5651A.

When a shunt capacitor is used with the 5651A, its value should be limited to 0.02 μF. A large value of capacitance may cause the tube to oscillate and thus give unstable performance.

Shielding should be utilized for the 5651A to insure maximum stability when the tube is operated in the presence of strong rf or magnetic fields.

Refer to chart at end of section.

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**SHARP-CUTOFF PENTODE**

**5654 INDUSTRIAL TYPE**

Miniature type sharp-cutoff pentode used in RF and IF broad-band applications at frequencies up to 400 mHz. Outlines section, 5B; requires miniature 7-contact socket.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (ac/dc)</td>
<td>6.3 ±10%</td>
</tr>
<tr>
<td>Heater Current</td>
<td>0.175</td>
</tr>
<tr>
<td>Heater-Cathode Voltage:</td>
<td>±100</td>
</tr>
</tbody>
</table>
| Direct Interelectrode Capacitance: | 0.020 max. | pF
| Grid No.1 to Plate               | 4.0         | pF
| Input                            | 2.85        | pF
| Output                           |             |     |

▲ With external shield.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>200</td>
</tr>
<tr>
<td>Grid-No.2 (Screen) Voltage</td>
<td>155</td>
</tr>
</tbody>
</table>
Plate Dissipation ........................................ 1.85    watts
Grid-No.2 Input ....................................... 0.55    watt
Cathode Current ...................................... 20      mA

**TYPICAL OPERATION AND CHARACTERISTICS**
Plate Voltage ........................................ 120  180    volts
Grid-No.2 Voltage .................................... 120  120    volts
Cathode-Bias Resistor ............................... 180  180    ohms
Plate Resistance (Approx.) ......................... 0.30  0.50    megohms
Transconductance .................................. 5000  5100    μmhos
Plate Current ....................................... 7.5    7.7    mA
Grid-No.2 Current ................................... 2.5    2.4    mA
Grid-No.1 Voltage (Approx.) for plate current of 10 μA ---8.5   ---8.5    volts

**MAXIMUM CIRCUIT VALUE**
Grid-No.1-Circuit Resistance ....................... 0.5    megohm

**Special Ratings & Performance Data**

**SHOCK RATING**
Impact Acceleration .................................. 500 max.    g

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

**HEATER CYCLING LIFE PERFORMANCE**
Cycles of Intermittent Operation .................. 2000 min.    cycles

**5654W**
Refer to chart at end of section.

**5654/6AK5W/ 6096**
Refer to chart at end of section.

**5663**
Refer to chart at end of section.

**5670**
Refer to chart at end of section.

**5670WA**
Refer to chart at end of section.

**5672**
Refer to chart at end of section.

**5678**
Refer to chart at end of section.

**5686**
Refer to chart at end of section.

**5687**
Refer to chart at end of section.

**5691**
Refer to chart at end of section.

**5692**
Refer to chart at end of section.

**5693**
Refer to chart at end of section.

---

**5696**
**INDUSTRIAL TYPE**
Miniature type gas-tetrode thyatron for use in counter-circuit relay applications. Outlines section, 5B; requires miniature 7-contact socket.

Heater Voltage (ac/dc) ............................. 6.3    volts
Heater Current ...................................... 0.150   ampere
Heater-Cathode Voltage:
Peak ............................................. +25, −100    volts
Cathode:
Minimum Heating Time, prior to tube conduction ........................................... 10 seconds

Direct Interelectrode Capacitances (Approx.):
  Grid No.1 to Anode ................................................................. 0.03 pF
  Input .................................................................................. 1.8 pF
  Output ................................................................................... 0.54 pF

Ionization Time (Approx.):
For conditions: dc anode volts = 100; grid-No.1 square-pulse volts = +50; peak cathode amperes during conduction
  = 0.150 ............................................................................... 0.5 µs

Deionization Time (Approx.):
For conditions: dc anode volts = 500; grid-No.1 volts = -100, grid-No.1 resistor (ohms) = 1000; dc cathode amperes
  = 0.025 ............................................................................... 25 µs
For conditions: dc anode volts = 500; grid-No.1 volts = -13; grid-No.1 resistor (ohms) = 1000; dc cathode amperes
  = 0.025 ............................................................................... 40 µs

Maximum Critical Grid-No.1 Current, with ac anode-supply volts (rms) = 350, and average cathode amperes = 0.025 ........................................ 0.5 µA

Anode Voltage Drop (Approx.) ............................................................................. 10 volts

Grid-No.1 Control Ratio (Approx.) with grid-No.1 resistor (meg-ohms) = 0; grid-No.2 volts = 0 ................................................................. 250

Grid-No.2 Control Ratio (Approx.) with grid-No.1 volts = 0, grid-
  No.2 resistor (ohms) = 0 ..................................................................... 15

Relay and Grid-Controlled Rectifier Service

MAXIMUM RATINGS (Absolute-Maximum Values)

Peak Anode Voltage:
  Forward .................................................................................. 500 volts
  Inverse .................................................................................. 500 volts

Grid-No.2 (Shield-Grid) Voltage:
  Peak, before anode conduction ...................................................... -50 volts
  Average, during anode conduction# .............................................. -10 volts

Grid-No.1 (Control-Grid) Voltage:
  Peak, before anode conduction ...................................................... -100 volts
  Average, during anode conduction# .............................................. -10 volts

Cathode Current:
  Peak ..................................................................................... 100 mA
  Average# ............................................................................. 25 mA
  Surge, for duration of 0.1 sec. max. ............................................. 2 amperes

Grid-No.2 Current:
  Average# ............................................................................. 5 mA

Grid-No.1 Current:
  Average# ............................................................................. 5 mA

Ambient Temperature Range ........................................................................... -55 to +90 °C

---

**TYPE 5696**
GRID-No.2 (SHIELD) VOLTS = 0
RANGES SHOWN ARE FOR TWO VALUES OF
GRID RESISTOR—0.1 MEG AND 10 MEG—AND
TAKE INTO ACCOUNT INITIAL DIFFERENCES
BETWEEN INDIVIDUAL TUBES & SUB-
SEQUENT DIFFERENCES DURING TUBE
LIFE, FOR A HEATER-VOLTAGE RANGE OF
5.7 TO 6.9 VOLTS AND FOR AN AMBIENT
TEMPERATURE RANGE OF -55 TO +90 °C

---

**Diagram:**
AC ANODE VOLTS (RMS—50 Hz)  
DC GRID-No.1 SUPPLY VOLTS

---

**Note:**
92CM-7045T
TYPICAL OPERATING CONDITIONS FOR RELAY SERVICE

RMS Anode Voltage ........................................ 117 volts
Grid No.2 .................................................... Connected to cathode at socket
RMS Grid-No.1 Bias Voltage* .................................. 5 volts
Peak Grid-No.1 Signal Voltage .................................. 5 volts
Grid-No.1-Circuit Resistance*# .............................. 0.1 megohm
Anode-Circuit Resistance..................................... 5000 ohms

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance .................................. 10 megohms

- Averaged over any interval of 30 sec. max.
- Approximately 180° out of phase with the anode voltage.
- Sufficient resistance, including the tube lead, must be used under any conditions of operation to prevent exceeding the current ratings.

5696A Refer to chart at end of section.
5718 Refer to chart at end of section.
5719 Refer to chart at end of section.
5725 Refer to chart at end of section.
5725/6AS6W Refer to chart at end of section.
5726 Refer to chart at end of section.
5726/6AL5W Refer to chart at end of section.
5726/6AL5W/6097 Refer to chart at end of section.

5727

INDUSTRIAL TYPE

Miniature type "Premium" gas-tetrode thyratron for use in relay, grid-controlled rectifier and pulse-modulator applications. Outlines section, 5C; requires miniature 7-contact socket.

Heater Voltage (ac/dc) .............................................. 6.3 ±10% volts
Heater Current ...................................................... 0.6 ampere
Cathode:
Minimum heating time prior to tube conduction = 20 seconds
Direct Inter-electrode Capacitances (Approx.):
Grid No.1 to anode .............................................. 0.026 pF
Grid No.1 to cathode, grid No.2, and heater .............. 2.4 pF
Anode to cathode, grid No.2, and heater .................. 1.6 pF
Ionization Time (Approx.): 0.5 μs
For dc anode volts = 100, grid-No.1 volts (square-wave pulse)
Deionization Time (Approx.): 35 μs
For dc anode volts = 125, dc anode amperes = 0.1, grid-No.1 resistor (ohms) = 1000, and grid-No.1 volts = -100
Maximum Critical Grid-No.1 Current: 75 μs
For anode-supply volts (rms) = 460, and average anode amperes = 0.5 μA
Anode Voltage Drop (Approx.) 8 volts
Grid-No.2 Control Ratio (Approx.) with grid-No.1 resistor (meg-ohms) = 0, grid-No.2 volts = 250
Grid-No.2 Control Ratio (Approx.) with grid-No.1 resistor (meg-ohms) = 0, grid-No.2 resistor (megohms) = 0, grid-No.1 volts = 1000
Relay and Grid-Controlled Rectifier Service

MAXIMUM RATINGS (Absolute-Maximum Values)

For anode-supply frequency of 60 Hz

Peak Anode Voltage:
   Forward ........................................... 650 volts
   Inverse ........................................... 1300 volts

Grid-No.2 (Shield-Grid) Voltage:
   Peak, before tube conduction .................... -100 volts
   Average*, during tube conduction ............... -10 volts

Grid-No.1 (Control-Grid) Voltage:
   Peak, before tube conduction .................... -100 volts
   Average*, during tube conduction ............... -10 volts

Cathode Current:
   Peak .............................................. 0.5 amperes
   Average .......................................... 0.1 amperes
   Fault, for duration of 0.1 second max. ........ 10 amperes

Grid-No.2 Current:
   Average .......................................... 10 mA

Grid-No.1 Current:
   Average .......................................... 10 mA

Heater-Cathode Voltage:
   Peak .............................................. +25, -100 volts
   Average .......................................... 150 °C

Bulb Temperature (At hottest point on bulb surface) ........ 150 °C
Ambient Temperature .................................... -75 °C

TYPICAL OPERATION FOR RELAY SERVICE

RMS Anode Voltage .................................. 117 volts
Grid-No.2 Voltage .................................. 0 volts
RMS Grid-No.1 Bias Voltage* ....................... 5 volts
DC Grid-No.1 Bias Voltage* ......................... -6 volts
Peak Grid-No.1 Signal Voltage ..................... 5 volts
Grid-No.1-Circuit Resistance* ..................... 11 ohms
Anode-Circuit Resistance* ......................... 1200 ohms

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance ....................... 10 megalohms

Pulse-Modulated Service

For rectangular-wave shapes, duty cycle of 0.001 max., pulse duration of 5 μs max., and pulse-repetition rate of 500 pps max.

MAXIMUM RATINGS (Absolute-Maximum Values)

Peak Anode Voltage:
   Forward .......................................... 500 volts
   Inverse .......................................... 100 volts

Grid-No.2 (Shield-Grid) Voltage:
   Peak, before tube conduction .................... -50 volts
   Average*, during tube conduction ............... -10 volts

Grid-No.1 (Control-Grid) Voltage:
   Peak, before tube conduction .................... -100 volts
   Average, during tube conduction ................. -10 volts

Cathode Current:
   Peak .............................................. 10 amperes
   Average .......................................... 10 mA
   Rate of change .................................... 100 A/μs
   Peak Grid-No.2 Current ........................... 20 mA
   Peak Grid-No.1 Current ........................... 20 mA

Heater-Cathode Voltage:
   Peak .............................................. -9 volt
   Average .......................................... 150 °C
   Ambient Temperature .............................. -75 °C

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance ....................... 0.5 megalohms
Grid-No.2-Circuit Resistance ....................... [25,000 max., 20,000 min.] ohms

* For pulse-modulator service, tolerance is +10%, -5%.
* Averaged over any interval of 30 seconds maximum.
* Approximately 180° out of phase with the anode voltage.
* Sufficient resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings.
Special Ratings and Performance Data

**SHOCK RATING**
Impact Acceleration ........................................ 750 max.  g

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

**HEATER-CYCLING LIFE PERFORMANCE**
Cycles of Intermittent Operation ........................... 2000 min.  cycles

Operating Considerations
Sufficient anode-circuit resistance, including the tube load, must be used under any conditions of operation to prevent exceeding the current ratings of the tube.

Curve shown under type 2D21 also applies to type 5727

5734  Refer to chart at end of section.
5749  Refer to chart at end of section.
5749/6BA6W  Refer to chart at end of section.
5750  Refer to chart at end of section.

5751
INDUSTRIAL
TYPE

Miniature type "Premium" high-mu twin triode used as a phase inverter and as a high gain amplifier in industrial control devices. Outlines section, 6B; requires miniature 9-contact socket.

<table>
<thead>
<tr>
<th>Heater Arrangement:</th>
<th>Series</th>
<th>Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (ac/dc)</td>
<td>12.6 ±10%</td>
<td>6.3 ±10%</td>
</tr>
<tr>
<td>Heater Current</td>
<td>0.175</td>
<td>0.360</td>
</tr>
</tbody>
</table>

**Class A1 Amplifier (Each Unit)**

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

| Plate Voltage | 330  volts |
| Grid Voltage: |       |
| Negative-bias value | 55  volts |
| Positive-bias value | 0   volt  |
| Plate Temperature (At hottest point on bulb surface) | 165 °C |

**CHARACTERISTICS**

| Plate Voltage | 100  volts |
| Grid Voltage | -1   volts |
| Amplification Factor | 70 |
| Plate Resistance | 58000  ohms |
| Transconductance | 1200  μmhos |
| Plate Current | 0.9  mA |

**SHOCK RATING**
Impact Acceleration ........................................ 600 max.  g
TECHNICAL DATA

FATIGUE RATING
Vibrational Acceleration ........................................ 2.5 max. \( g \)

LOW-FREQUENCY VIBRATION PERFORMANCE
RMS Output Voltage .................................................. 100 max. \( mV \)

HEATER-CYCLING LIFE PERFORMANCE
Cycles of Intermittent Operation ................................ 2000 min. cycles

Refer to chart at end of section.

5751WA

VHF BEAM POWER TUBE

Miniature type VHF beam power amplifier for use in low-power mobile transmitters and the low-power stages of larger fixed station transmitters. Outlines section, 6E; requires miniature 9-contact socket.

Heater Voltage (ac/dc) .................................................. 6.0 \( \pm 10\% \) volts
Heater Current ....................................................... 0.75 ampere
Heater-Cathode Voltage:
Peak ........................................................................... \( \pm 100 \) max. volts
Transconductance for plate current of 45 mA ............... 7000 \( \mu \)mhos
Mu-Factor, Grid No. 2 to Grid No. 1 .......................... 16
Direct Interelectrode Capacitances:
Grid No. 1 to Plate .................................................. 0.3 max \( pF \)
Input ........................................................................... 9.5 \( pF \)
Output .......................................................................... 4.5 \( pF \)

Plate-Modulated RF Power Amplifier—Class C Telephony
Carrier conditions per tube for use with a max. modulation factor of 1.0
CCS•• ICAS••

MAXIMUM RATINGS (Absolute-Maximum Values)

DC Plate Voltage ......................................................... 250 300 volts
DC Grid-No.3 (Suppressor) Voltage .............................. 0 0 volts
DC Grid-No.2 (Screen) Voltage .................................. 250 250 volts
DC Grid-No.1 (Control-Grid) Voltage ......................... -125 -125 volts
DC Plate Current ....................................................... 40 50 mA
DC Grid-No.2 Current .............................................. 15 15 mA
DC Grid-No.1 Current .............................................. 5 5 mA
Plate Input ................................................................. 10 15 watts
Grid-No.2 Input ......................................................... 1.5 1.5 watts
Plate Dissipation ..................................................... 8 12 watts
Bulb Temperature (At hottest point on bulb surface) .... 250 250 °C

5763
INDUSTRIAL TYPE
## TYPICAL OPERATION UP TO 30 MHz

<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>Grid No.3 Voltage</td>
<td>Connected to cathode at socket</td>
</tr>
<tr>
<td>DC Grid-No.2 Voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage*</td>
<td>-39 – -42.5 V</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>39000 – 18000 Ω</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>46.5 – 53.5 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40 – 50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5.6 – 6 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1 – 2.4 mA</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.05 – 0.15 Watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>6.4 – 10 Watt</td>
</tr>
</tbody>
</table>

### MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance: 0.1 – 0.1 megohm

---

## RF Power Amplifier & Oscillator—Class C Telegraphy

### MAXIMUM RATINGS (Absolute-Maximum Values)

<table>
<thead>
<tr>
<th>Parameter</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>-28.5</td>
<td>-28.5</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>18000</td>
<td>18000</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>37.5</td>
<td>37</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50</td>
<td>48.5</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>6.6</td>
<td>6.2</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>10.3</td>
<td>12</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>12</td>
<td>13.5</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>250</td>
<td>250 °C</td>
</tr>
</tbody>
</table>

## TYPICAL OPERATION UP TO 30 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 – 350 V</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 – 250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage*</td>
<td>-28.5 – -28.5 V</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>18000 – 18000 Ω</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>37.5 – 37 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 – 48.5 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>6.6 – 6.2 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1.6 – 1.6 mA</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.1 – 0.1 Watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>10.3 – 12 Watt</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>12 – 13.5 Watt</td>
</tr>
</tbody>
</table>

### MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance: 0.1 – 0.1 megohm

---

## TYPICAL OPERATION AT 50 MHz

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 – 350 V</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 – 250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage*</td>
<td>-60 – -60 V</td>
</tr>
<tr>
<td>From a grid resistor of</td>
<td>22000 – 22000 Ω</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>80 – 80 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 – 50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>5 – 5 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>3 – 3 mA</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.35 – 0.35 Watt</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>7 – 7 Watt</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>12 – 12 Watt</td>
</tr>
</tbody>
</table>

### MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance: 0.1 – 0.1 megohm

---

## Frequency Multiplier

### MAXIMUM CCS• RATINGS (Absolé-Maximum Values)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300 – 350 V</td>
</tr>
<tr>
<td>DC Grid-No.3 (Suppressor) Voltage</td>
<td>0 – 0 V</td>
</tr>
<tr>
<td>DC Grid-No.2 (Screen) Voltage</td>
<td>250 – 250 V</td>
</tr>
<tr>
<td>DC Grid-No.1 (Control-Grid) Voltage</td>
<td>-125 – -125 V</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>50 – 50 mA</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>15 – 15 mA</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>5 – 5 mA</td>
</tr>
<tr>
<td>Plate Input</td>
<td>15 – 15 Watt</td>
</tr>
<tr>
<td>Plate Dissipation</td>
<td>2 – 2 Watt</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>250</td>
</tr>
</tbody>
</table>
TYPICAL OPERATION

<table>
<thead>
<tr>
<th>Doubler to 175 MHz</th>
<th>Tripler to 175 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Plate Voltage</td>
<td>300</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>*</td>
</tr>
<tr>
<td>DC Grid-No.1 Voltage</td>
<td>-75</td>
</tr>
<tr>
<td>From grid resistor of</td>
<td>75000</td>
</tr>
<tr>
<td>Peak RF Grid-No.1 Voltage</td>
<td>95</td>
</tr>
<tr>
<td>DC Plate Current</td>
<td>40</td>
</tr>
<tr>
<td>DC Grid-No.2 Current</td>
<td>4</td>
</tr>
<tr>
<td>DC Grid-No.1 Current (Approx.)</td>
<td>1</td>
</tr>
<tr>
<td>Driving Power (Approx.)</td>
<td>0.6</td>
</tr>
<tr>
<td>Useful Power Output (Approx.)</td>
<td>2.1***</td>
</tr>
</tbody>
</table>

MAXIMUM CIRCUIT VALUE (For maximum rated conditions)

<table>
<thead>
<tr>
<th>Grid-No.1-Circuit Resistance</th>
<th>0.1</th>
<th>0.1</th>
</tr>
</thead>
</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.
@ 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.
* Continuous Commercial Service.
** Intermittent Commercial and Amateur Service.
+ Obtained from plate supply of 300 volts through a series resistor of 12500 ohms.

Refer to chart at end of section.

5783

MEDIUM-MU TWIN TRIODE 5814A

INDUSTRIAL TYPE

Miniature type "Premium" medium-mu twin triode used in a wide variety of applications including mixers, oscillators, multivibrators and synchronizing amplifiers in industrial control equipment. Outlines section, 6B; requires miniature 9-contact socket.

<table>
<thead>
<tr>
<th>Heater Arrangement</th>
<th>Series</th>
<th>Parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Voltage (ac/dc)</td>
<td>12.6 ±10%</td>
<td>6.3 ±10%</td>
</tr>
<tr>
<td>Heater Current</td>
<td>0.175</td>
<td>0.350</td>
</tr>
<tr>
<td>Heater-Cathode Voltage:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak value</td>
<td>±100 max</td>
<td>±100 max</td>
</tr>
<tr>
<td>Direct Inter-electrode Capacitances (Approx.)</td>
<td>Unit No. 1</td>
<td>Unit No. 2</td>
</tr>
<tr>
<td>Grid to Plate</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Grid to Cathode and Heater</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Plate to Cathode and Heater</td>
<td>0.5</td>
<td>0.4</td>
</tr>
</tbody>
</table>

pF
Class A\textsubscript{1} Amplifier (Each Unit Unless Otherwise Specified)

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>380 volts</td>
</tr>
<tr>
<td>Cathode Current</td>
<td>22 mA</td>
</tr>
<tr>
<td>Plate Dissipation:</td>
<td></td>
</tr>
<tr>
<td>Each Plate</td>
<td>3.0 watts</td>
</tr>
<tr>
<td>Both Plates (Both units operating)</td>
<td>6.0 watts</td>
</tr>
<tr>
<td>Bulb Temperature (At hottest point on bulb surface)</td>
<td>165 °C</td>
</tr>
</tbody>
</table>

**CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate Voltage</td>
<td>100</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>250</td>
</tr>
<tr>
<td>Grid Voltage</td>
<td>-8.5</td>
</tr>
<tr>
<td>Amplification Factor</td>
<td>19.5</td>
</tr>
<tr>
<td>Plate Resistance (Approx.)</td>
<td>6250</td>
</tr>
<tr>
<td>Transconductance</td>
<td>7700 ohms</td>
</tr>
<tr>
<td>Plate Current</td>
<td>-11.8</td>
</tr>
<tr>
<td>Grid Voltage (Approx.) for plate current of 10 (\mu)A</td>
<td>-22</td>
</tr>
<tr>
<td>Grid Voltage (Approx.) for plate current of 10 (\mu)A</td>
<td>-22</td>
</tr>
</tbody>
</table>

**MAXIMUM CIRCUIT VALUES**

Grid-Circuit Resistance:
For fixed-bias operation .................................. 0.25 megohm
For cathode-bias operation ................................ 1 megohm

![TYPE 5814A EACH UNIT](chart)

**TYPICAL OPERATION AS RESISTANCE-COUPLED AMPLIFIER**

See RESISTANCE-COUPLED AMPLIFIER CHART type 12AU7A conditions

**Special Ratings & Performance Data**

**SHOCK RATING**
Impact Acceleration ..................................... 600 max. g

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

**LOW-FREQUENCY VIBRATION PERFORMANCE**
RMS Output Voltage .................................... 100 max. mV

**HEATER-CYCLING LIFE PERFORMANCE**
Cycles of Intermittent Operation ....................... 2000 min. cycles

**AUDIO-FREQUENCY NOISE AND MICROPHONIC PERFORMANCE**
RMS Output Voltage .................................... 100 max. mV

5814WA Refer to chart at end of section.