RCA-5840 is a sharp-cutoff subminiature pentode of the heater-cathode type designed primarily for use as an rf or if amplifier in high-frequency broad-band circuits of mobile and aircraft receivers where dependable performance under shock and vibration is a prime consideration. As an rf amplifier, the 5840 can be used at frequencies up to about 400 Mc.

The 5840 features a pure-tungsten heater to give long life under conditions of frequent on-off switching, three leads to the cathode to permit isolation of the input and output circuit returns, and a compact design in which special attention has been given to structural details that provide increased mount strength to resist shock and vibration. In addition, each 5840 is manufactured under rigid controls and undergoes rigorous tests to insure its "premium" quality.

The 5840 supersedes the 5901.

GENERAL DATA

Electrical:
Heater, for unipotential cathode:
Voltage (AC or DC) 6.3 ± 5% volts
Current 0.150 ampere
Direct interelectrode Capacitance:
With External Shield 0.015 max.
Without External Shield 0.03 max. µµf
Grid No.1 to Plate 4.2 4.0 µµf
Input 3.4 1.9 µµf
Output 1.9 1.2 µµf

Leadable, Flexible 8
Length 1-1/2" to 1-3/4" Orientation and Diameter See Dimensional Outline

AMPLIFIER - Class A

Maximum Ratings, Absolute Values:
DC PLATE VOLTAGE 165 max. volts
GRID-No.2 (SCREEN) VOLTAGE 155 max. volts
GRID-No.1 (CONTROL-GRID) VOLTAGE Negative bias value 55 max. volts
PLATE DISSIPATION 1.1 max. watts
GRID-No.2 INPUT 0.55 max. watt
DC CATHODE CURRENT 16.5 max. ma
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode 200 max. volts
Heater positive with respect to cathode 200 max. volts
BULB TEMPERATURE (At hottest point on bulb surface) 250 max. °C

Characteristics:
Plate Supply voltage 100 volts
Grid-no.2 Supply voltage 100 volts
Cathode Resistor 150 ohms
Plate Resistance 260000 ohms
Transconductance 5000 µµhos
Plate Current 7.5 ma
Grid-no.2 Current 2.4 ma
Grid-no.1 Volts (Approx.) for plate current of 10 µµamp -9 volts

Typical Operation as Resistance-Coupled Amplifier:
See Chart on Page 2

Maximum Circuit Values:
Grid-no.1-Circuit Resistance:
For cathode-bias operation 1.2 max. megohms
For fixed-bias operation Not recommended

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>0.138</td>
<td>0.162 µµamp</td>
</tr>
<tr>
<td>Grid-no.1-Plate Capacitance</td>
<td>1</td>
<td>0.015 µµf</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>2</td>
<td>3.5 4.9 µµf</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>2</td>
<td>2.9 3.9 µµf</td>
</tr>
<tr>
<td>Plate Current</td>
<td>1.3</td>
<td>5.5 9.5 ma</td>
</tr>
<tr>
<td>Plate Current</td>
<td>1.4</td>
<td>5.0 µµamp</td>
</tr>
<tr>
<td>Transconductance</td>
<td>1.3</td>
<td>4100 5900 µµhos</td>
</tr>
<tr>
<td>Transconductance</td>
<td>5.3</td>
<td>3750 µµhos</td>
</tr>
<tr>
<td>Grid-no.1 Current</td>
<td>1.6</td>
<td>40.3 µµamp</td>
</tr>
<tr>
<td>Grid-no.2 Current</td>
<td>1.3</td>
<td>0.5 3.6 ma</td>
</tr>
<tr>
<td>Plate Resistance</td>
<td>1.7</td>
<td>0.175</td>
</tr>
<tr>
<td>Heater-cathode Leakage Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>heater negative with respect to cathode</td>
<td>1.8</td>
<td>7.0 µµamp</td>
</tr>
<tr>
<td>heater positive with respect to cathode</td>
<td>1.8</td>
<td>7.0 µµamp</td>
</tr>
</tbody>
</table>

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5840-2-53

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5840 SHARP-CUTOFF PENTODE
"Premium" Subminiature Type
For RF and IF Broad-Band Applications
TENTATIVE DATA
CHARACTERISTICS RANGE VALUES (Cont'd)

Leakage Resistance:
- Between Grid No.1 and All Other Electrodes
  Tied Together ... 1.9
  100 - megohms

- Between Plate and All Other Electrodes
  Tied Together ... 1.10
  100 - megohms

* Each tube is stabilized before characteristics testing by continuous operation for at least 45 hours at room temperature and with dissipation values equivalent to life test conditions.

Note 1: With 6.3 volts ac or dc on heater.
Note 2: With external shield having inside diameter of 0.405" and connected to cathode.
Note 3: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads.
Note 4: With dc plate voltage of 100 volts, dc grid-No.2 voltage of 100 volts, and dc grid-No.1 voltage of 0 volts.
Note 5: With 5.7 volts ac or dc on heater.
Note 6: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms, and cathode bypass capacitor of 1000 microfarads, and grid-No.1 resistor of 0.1 megohm.
Note 7: With plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms.
Note 8: With 100 volts dc between heater and cathode.
Note 9: With grid-No.1 100 volts negative with respect to all other electrodes tied together.
Note 10: With plate 100 volts negative with respect to all other electrodes tied together.

SPECIAL RATINGS & PERFORMANCE DATA

Shock Rating:
Impact Acceleration .......... 450 max.
Tubes are held rigid in three different positions in a Navy type, high-impact [flyweight] shock machine and are subjected to 450 g impact acceleration.

Fatigue Rating:
Vibrational Acceleration .......... 2.5 max.
Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 60 cycles per second for 32 hours.

Uniform Acceleration Rating .......... 1000 max.
Tubes are subjected in each of three positions to a gradually applied uniform acceleration up to 1000 g.

High-Frequency Vibration Performance:
RMS output voltage .......... 60 max.
Tested under the following conditions: A 100 volt plate and grid-No.2 voltage supply having an impedance not exceeding that of a 40-microfarad capacitor, plate load resistance of 10000 ohms, grid-No.1 resistor of 0.1 megohm, cathode resistor of 150 ohms, cathode bypass capacitor of 1000 microfarads, and cathode bypass resistance of 40 g at 40 cycles.

Heater-Cycling Life Performance:
Cycles of intermittent operation. * 2500 min. cycles under the following conditions: With heater voltage of 7.0 volts cycles 1 minute on and 4 minutes off, heater-cathode voltage of 140 volts (rms), and plate, grid-No.2, and grid-No.1 voltage 0 volts.

Average Life Performance:
The average life performance based on a 500-hour test at 175°C ambient temperature is not less than 450 hours. This life test is made on sample lot of tubes with heater voltage of 6.3 volts, plate supply voltage of 100 volts; grid-No.2 supply voltage of 100 volts; dc heater-cathode voltage (heater positive with respect to cathode) of 200 volts; plate cathode resistor of 150 ohms; and grid-No.1 resistor of 0.1 megohm.

The 500-hour end-point limits for the 5B40 with heater voltage of 6.3 volts, plate supply voltage of 100 volts, grid-No.2 supply voltage of 100 volts, cathode resistor of 150 ohms bypassed by capacitor having a maximum reactance of 3 ohms, and dc heater-cathode voltage of 100 volts with heater either positive or negative with respect to cathode are: transconductance, 3250 microamhos; minimum; heater-cathode leakage current, 20 microamperes maximum; and grid-No.1 current, 0.9 microampere maximum.

OPERATING NOTES

The maximum ratings in the tabulated data for the 5B40 are limiting values above which the serviceability of the 5B40 may be impaired from the viewpoint of life and satisfactory performance. Therefore, in order not to exceed these absolute ratings, the equipment designer has the responsibility of determining an average design value for each rating below the absolute value of that rating.
rating by an amount such that the absolute values will never be exceeded under any usual condition of supply-voltage variation, load variation, or manufacturing variation in the equipment itself.

The heater supply should be well regulated because life and reliability of the 5840 are adversely affected by departures from the 6.3-volt value. The extent to which life is affected is a function of the amounts of these departures and their durations.

The cathode is provided with 3 leads. It is suggested that leads 2 and 8 be used for the input circuit return and that lead 4 be used for the output circuit return. This practice reduces the portion of input loading due to cathode lead inductance and reduces feedback effects.

The flexible leads of the 5840 are usually soldered to the circuit elements. Soldering of the connections should be made as far as possible from the glass button. If this precaution is not followed, the heat of the soldering operation may crack the glass seals of the leads and damage the tube.
DIMENSIONAL OUTLINE

FLEXIBLE LEAD CONNECTIONS

LEAD NO. 1: GRID NO. 1
LEAD NO. 2: CATHODE, GRID NO. 3
LEAD NO. 3: HEATER
LEAD NO. 4: CATHODE, GRID NO. 3

LEAD NO. 5: PLATE
LEAD NO. 6: HEATER
LEAD NO. 7: GRID NO. 2
LEAD NO. 8: CATHODE, GRID NO. 3

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