**MEDIUM-MU TWIN TRIODE**

"Premium" Subminiature Type

For Operation at Altitudes Up to 60000 Feet

TENTATIVE DATA

RCA-6111 is a subminiature medium-mu twin triode of the heater-cathode type having flexible leads. It is intended for use in oscillator and amplifier applications at frequencies up through the VHF region. Constructed to give dependable performance under conditions of shock and vibration, this "premium" tube is especially suited for use in critical industrial applications and in aircraft equipment. Full ratings may be used at altitudes up to 60000 feet without the use of pressurized chambers.

In the 6111, special attention has been given to structural features which improve its strength for resistance to both shock and vibration. These features include a special "M" frame construction to keep the mount rigid, and special tube parts which are precisely made and accurately fitted to lock the parts firmly in place and thus eliminate variations in electrical characteristics. Other features include grid rods having high heat conductivity to provide cool operation thereby minimizing grid emission, a pure-tungsten heater having high mechanical strength to give long life under conditions of frequent on-off switching, and a special getter shield to prevent deposit ofgetter flash on tube elements. These features in addition to rigid controls and rigorous tests to insure "premium" quality, make this tube especially useful in military and critical industrial applications.

### GENERAL DATA

#### Electrical:

- Heater, for Unipotential Cathodes:
  - Voltage (AC or DC) ........... 6.3 ± 5% volts
  - Current ........... 0.3 ampere
- Direct interelectrode Capacitances:
<table>
<thead>
<tr>
<th>With External Shield</th>
<th>Without External Shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid to plate (each unit)</td>
<td>1.4</td>
</tr>
<tr>
<td>Grid to cathode and heater (each unit)</td>
<td>2.1</td>
</tr>
<tr>
<td>Plate to cathode and heater (Unit No.1)</td>
<td>1.3</td>
</tr>
<tr>
<td>Plate to cathode and heater (Unit No.2)</td>
<td>1.4</td>
</tr>
</tbody>
</table>

#### Mechanical:

- Grid to grid ........... 0.010 max. μf
- Plate to plate ........... 0.5 max. μf

- Operating Position: Any
- Maximum Bulb Length: 1 1/8”
- Length from Button Seal to Bulb Top (Excluding tip): 0.400” max. - 0.365” min.
- Bulb Diameter: 0.250” max. 0.215” min.
- Leads, Flexible: 8
- Minimum Length: 1.5”
- Orientation and Diameter: See Dimensional Outline

### AMPLIFIER -- Class A

**Maximum Ratings, Absolute Values:**

For Operation at altitudes up to 60000 Feet

Values are for Each Unit

| Plate Voltage | 155 max. volts |
| Grid Voltage | 55 max. volts |
| Positive Bias | 50 max. volts |
| Negative Bias | 50 max. volts |
| Plate Dissipation | 1.0 max. watts |
| 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
- Cathode Resistor: 220 ohms
- Amplification Factor: 1000
- Plate Resistance (Approx.): 4000 ohms
- Transconductance: 5000 μmhos
- Plate Current: 8.5 mA
- Grid Voltage (Approx.) for plate current of 10 μA: -9 volts

### Maximum Circuit Values:

- Grid-Circuit Resistance: For cathode-bias operation: 1.2 max. megohms

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**CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN**

Values are for Each Unit and are Initial, Unless Otherwise Specified

<table>
<thead>
<tr>
<th>Note</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater Current</td>
<td>1</td>
<td>280</td>
</tr>
<tr>
<td>Direct interelectrode Capacitances:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid to plate</td>
<td>2</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**THANKS, Marco Registrada**

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ELECTRON TUBE DIVISION

RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY

6111 11-57
SPECIAL RATINGS AND PERFORMANCE DATA

Values are for Each Unit, Unless Otherwise Specified

Shock Rating:
Impact Acceleration ................ 450 max. g
This test is performed on a sample lot of tubes from each production run. Tubes are held rigidly and are tested in four different positions. At the end of each test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Fatigue Rating:
Vibrational Acceleration ............ 2.5 max. g
This test is performed on a sample lot of tubes from each production run. Tubes are rigidly mounted and subjected in each of three positions to 2.5 g vibrational acceleration at 40 cycles per second for 32 hours. At the end of this test, tubes will not show permanent or temporary shorts or open circuits, and are required to meet established limits for low-frequency vibration, heater-cathode leakage current, and transconductance change.

Low-Frequency Vibration Performance:
RMS Output Voltage ............... 100 max. mv
This test is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts, plate supply voltage of 100 volts, cathode resistor of 220 ohms, cathode-by-pass capacitor of 1000 µF. Plate load resistor of 10000 ohms and vibrational acceleration of 15 g at 40 cps.

Heater-Cycling Life Performance:
Cycles of intermittent operation ... 2000 min. cycles
Under the following conditions: heater voltage of 7.0 volts cycled one minute on four minutes off, heater 140 volts rms with respect to cathode, and all other elements grounded. At the end of this test, tubes will not show heat-cathode shorts or open circuits.

Audio-Frequency Noise and Microphonic Performance:
Output Voltage .................... 60 max. mv
This test is performed on a sample lot of tubes from each production run under the following conditions: heater voltage of 6.3 volts, plate supply voltage of 100 volts, cathode resistor of 1000 ohms, plate load resistor of 0.01 megohm, and cathode by-pass capacitor of 1000 µF. The output voltage of a tube, when tapped, will not cause a reading on a meter greater than the produced microvolt input under the condition specified in the Characteristics Range Values for reverse grid current.

Shorts and Continuity Test:
This test is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Life-test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 1 hour, the value of transconductance is read. The variation in transconductance from the 0-hour reading will not exceed 10 per cent.

100-Hour Survival Life Performance:
This test is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified under 500-Hour Intermittent Life Performance, except that the test run at room temperature. At the end of 100 hours, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, or a value of reverse grid current in excess of 1.0 microampere under the conditions specified in Characteristics Range Values.

Note 1: With 6.3 volts ac or dc on heater.
Note 2: With no external shield.
Note 3: With supply voltage of 100 volts, cathode resistor of 720 ohms, and cathode bypass capacitor of 1000 µF. Each unit is tested separately. Elements of unit not under test are grounded.
Note 4: With plate voltage of 100 volts and grid voltage of -9 volts. Each unit is tested separately. Elements of unit not under test are grounded.
Note 5: With plate voltage of 100 volts, grid resistor of 1 meegohm, and grid resistor of 200 ohms. Each unit is tested separately, unit not under test is grounded.
Note 6: With plate voltage of 100 volts, grid resistor of 1 meegohm, and grid voltage of -9 volts. Preheated prior to testing for 5 minutes at heater voltage of 250 volts ac or dc, plate voltage of 100 volts, grid resistor of 1 meegohm, and cathode resistor of 220 ohms.
Note 7: With plate voltage of 100 volts, grid resistor of 1 meegohm, and grid voltage of -9 volts. Preheated prior to testing for 5 minutes at heater voltage of 7.5 volts ac or dc, plate voltage of 100 volts, grid resistor of 1 meegohm, and cathode resistor of 220 ohms.
Note 8: With 100 volts between heater and cathode. Each unit is tested separately, unit not under test is grounded.
Note 9: With grid 100 volts negative with respect to all other electrodes tied together.
Note 10: With plate 300 volts negative with respect to all other electrodes tied together.
500-Hour Intermittent Life Performance:
This test is performed on a sample lot of tubes from each production run to insure high quality of the individual tube and to guard against epidemic failures of any of the characteristics indicated below. Life testing is conducted under the following conditions: Heater voltage of 4.3 volts, plate supply voltage of 100 volts, heater-cathode voltage of 200 volts (heater positive with respect to cathode), cathode resistor of 220 ohms, grid-No.1 resistor of 1 megohm and bulb temperature of 220°C. At the end of 500 hours, tube will not show permanent short or open circuits, and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to pass established initial limits of heater current, individual transconductance change, transconductance change with heater voltage of 5.7 volts, and 500 hour limits for reverse grid current, heater-cathode leakage current, leakage resistance, and the difference in transconductance between the initial value and average value shown under Characteristics Range Values.

OPERATING CONSIDERATIONS
The maximum ratings in the tabulated data for the 611T are limiting values above which the serviceability of the 611T 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 below each absolute 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 611T are adversely affected by departures from the 4.3 volt value. The extent to which life is affected is a function of the amount of these departures and their durations.

The flexible leads of the 611T 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 may crack the glass seals of the leads and damage the tube.

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DIMENSIONAL OUTLINE

TERMINAL CONNECTIONS

LEAD NO.1: PLATE OF TRIODE UNIT NO.2
LEAD NO.2: GRID OF TRIODE UNIT NO.2
LEAD NO.3: HEATER
LEAD NO.4: CATHODE OF TRIODE UNIT NO.2
LEAD NO.5: CATHODE OF TRIODE UNIT NO.1
LEAD NO.6: HEATER
LEAD NO.7: GRID OF TRIODE UNIT NO.1
LEAD NO.8: PLATE OF TRIODE UNIT NO.2

* MEASURED FROM BULB SEAT TO BULB-TOP LINE AS DETERMINED BY A RING GAUGE OF 0.250" ± 0.001" ID.
Fig. 1 - Average Characteristics for Each Unit of Type 6111.

Fig. 2 - Average Characteristics for Each Unit of Type 6111.

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