The 5899 is a subminiature, semi-remote-cutoff pentode for use as a wide-band, high-frequency amplifier. Its semi-remote-cutoff characteristic makes it suitable for use in circuits to which it is desired to apply automatic-gain-control.

The 5899 is a special-quality tube for use in critical industrial and military applications in which operational dependability is of primary importance. Features of the tube include a high degree of mechanical strength and a heater-cathode construction capable of withstanding many-thousand cycles of intermittent operation. When used in on-off control applications, the tube will maintain its emission capabilities after long periods of operation under cutoff conditions.

**GENERAL**

**ELECTRICAL**
Cathode—Coated Unipotential
Heater Voltage, AC or DC. .......................... 6.3 ± 5% Volts
Heater Current ....................................... 0.15 Amperes
Direct Interelectrode Capacitances

<table>
<thead>
<tr>
<th>With Shield*</th>
<th>Without Shield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Number 1 to Plate, maximum .................. 0.015</td>
<td>0.03 μf</td>
</tr>
<tr>
<td>Input .............. 4.2</td>
<td>4.0 μf</td>
</tr>
<tr>
<td>Output ............ 3.4</td>
<td>1.9 μf</td>
</tr>
</tbody>
</table>

*With external shield of 0.405-inch inside diameter connected to cathode.

**MECHANICAL**
Mounting Position—Any
Envelope—T-3, Glass
Base—E8-10, Subminiature Button 8-Lead

**PHYSICAL DIMENSIONS**

```
T3
1.075" MAX.
± 0.060" MAX.
1.375" MAX.
400" MAX.
.366" MIN
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*SUBMINIATURE BASE 8-LEAD

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RETMA 3-1

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Supersedes ET-T1098 dated 8-54
MAXIMUM RATINGS

ABSOLUTE MAXIMUM VALUES
Plate Voltage .......................................................... 165 Volts
Screen Voltage ......................................................... 155 Volts
Negative DC Grid-Number 1 Voltage ...................... 55 Volts
Plate Dissipation ...................................................... 0.75 Watts
Screen Dissipation .................................................. 0.35 Watts
DC Cathode Current ................................................. 16.5 Milliamperes
Heater-Cathode Voltage
  - Heater Positive with Respect to Cathode .............. 200 Volts
  - Heater Negative with Respect to Cathode ............ 200 Volts
Bulb Temperature at Hottest Point ....................... 220 °C

CHARACTERISTICS AND TYPICAL OPERATION

CLASS A1 AMPLIFIER
Plate Voltage .......................................................... 100 Volts
Screen Voltage ......................................................... 100 Volts
Cathode-Bias Resistor ............................................. 120 Ohms
Plate Resistance, approximate ......................... 0.26 Megohms
Transconductance .................................................. 4500 Micromhos
Plate Current ......................................................... 7.2 Milliamperes
Screen Current ......................................................... 2.0 Milliamperes
Grid-Number 1 Voltage, approximate
  \( G_m = 25 \text{ Micromhos} \) .................................. \(-14\) Volts

CHARACTERISTICS LIMITS

\begin{array}{lcl}
\text{Heater Current} & \text{Minimum} & \text{Maximum} \\
\text{Initial} & 140 & 160 \text{ Milliamperes} \\
500\text{-Hr} & 138 & 164 \text{ Milliamperes} \\
\text{Plate Current} & \text{Initial} & 5.2 & 9.2 \text{ Milliamperes} \\
\text{Screen Current} & \text{Initial} & 1.0 & 3.0 \text{ Milliamperes} \\
\text{Transconductance (1)} & \text{Initial} & 3800 & 5200 \text{ Micromhos} \\
\text{Transconductance Change with Heater Voltage} & \text{Initial} & 10 & 15 \text{ Percent} \\
\text{Transconductance Change with Operation} & \text{500-Hr} & 20 \text{ Percent} \\
\text{Average Transconductance Change with Operation} & \text{500-Hr} & 15 \text{ Percent} \\
\text{Plate Resistance} & \text{Initial} & 0.175 \text{ Megohms} \\
\text{Transconductance Cutoff} & \text{Initial} & 1.0 & 75 \text{ Micromhos}
\end{array}

CHARACTERISTICS LIMITS CONTINUED ON PAGE 3
CHARACTERISTICS LIMITS (Cont’d)

Interelectrode Capacitances

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-Number 1 to Plate (g1 to p)</td>
<td>Initial</td>
<td>0.015 μ\text{f}</td>
</tr>
<tr>
<td>Input (g1 to h, k, g2, g3)</td>
<td>Initial</td>
<td>3.8 μ\text{f}</td>
</tr>
<tr>
<td>Output (p to h, k, g2, g3)</td>
<td>Initial</td>
<td>2.9 μ\text{f}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.9 μ\text{f}</td>
</tr>
<tr>
<td>Measured with external shield of 0.405-inch diameter connected to cathode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Negative Grid-Number 1 Current

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Initial</th>
<th>500-Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 120 ohms (by-passed), Rg1 = 1.0 meg</td>
<td>0.3 Microamperes</td>
<td>0.8 Microamperes</td>
</tr>
</tbody>
</table>

Heater-Cathode Leakage Current

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Initial</th>
<th>500-Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef = 6.3 volts, Ehk = 100 volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater Positive with Respect to Cathode</td>
<td>5.0 Microamperes</td>
<td>10 Microamperes</td>
</tr>
<tr>
<td>Heater Negative with Respect to Cathode</td>
<td>5.0 Microamperes</td>
<td>10 Microamperes</td>
</tr>
</tbody>
</table>

Interelectrode Leakage Resistance

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Initial</th>
<th>500-Hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef = 6.3 volts. Polarity of applied d-c interelectrode voltage is such that no cathode emission results, Grid-Number 1 to All at 100 Volts DC</td>
<td>100 Megohms</td>
<td>50 Megohms</td>
</tr>
<tr>
<td>Plate to All at 300 Volts DC</td>
<td>100 Megohms</td>
<td>50 Megohms</td>
</tr>
</tbody>
</table>

Vibrational Noise Output Voltage, RMS

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Initial</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef = 6.3 volts, Ebb = 100 volts, Ec2 = 100 volts, Rk = 120 ohms (by-passed), R_L = 10,000 ohms, Vibrational acceleration = 15 G at 40 cps</td>
<td>60 Millivolts</td>
<td></td>
</tr>
</tbody>
</table>

Grid-Number 1 Emission Current

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Initial</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef = 7.5 volts, Eb = 100 volts, Ec2 = 100 volts, Ecc1 = −14 volts, Rg1 = 1.0 meg</td>
<td>0.5 Microamperes</td>
<td></td>
</tr>
</tbody>
</table>

The indicated 500-hour values are life-test end points for the following conditions of operation: Ef = 6.3 volts, Eb = 100 volts, Ec2 = 100 volts, Rk = 120 ohms, Rg1 = 1.0 meg, Ehk = 200 volts with heater positive with respect to cathode, and bulb temperature = 220°C minimum.
SPECIAL TESTS AND RATINGS

Stability Life Test
Statistical sample operated for one hour to evaluate and control initial variations in transconductance.

Survival Rate Life Test
Statistical sample operated for one hundred hours to evaluate and control early-life electrical and mechanical inoperatives.

Heater-Cycling Life Test
Statistical sample operated for 2000 cycles to evaluate and control heater-cathode defects. Conditions of test include $E_f = 7.0$ volts cycled for one minute on and four minutes off, $E_b = E_c2 = E_c1 = 0$ volts, and $E_{hk} = 140$ volts RMS.

Shock Rating—450 G
Statistical sample subjected to five impact accelerations of 450 G in each of four different positions. The accelerating forces are applied by the Navy-type, High Impact (flyweight) Shock Machine for Electronic Devices or its equivalent.

Fatigue Rating—2.5 G
Statistical sample subjected to vibrational acceleration of 2.5 G for 32 hours minimum in each of three different positions. The sinusoidal vibration is applied at a fixed frequency between 25 and 60 cycles per second.

Altitude Rating—60,000 Feet
Statistical sample subjected to pressure of 55 millimeters of mercury to evaluate and control arcing and corona.

Note: The conditions for some of the indicated tests have deliberately been selected to aggravate tube failures for test and evaluation purposes. In no sense should these conditions be interpreted as suitable circuit operating conditions.

In the design of military equipment employing this tube, reference should be made to the appropriate MIL-E-1 specification.