MECHANICAL DATA

Bulb .................................. T-3
Base .................................. E8-10, Subminiature Button Flexible Leads
Outline ................................ JETEC 3-1
Basing ................................ 8DD
Cathode ................................. Coated Unipotential
Mounting Position ..................... Any

RATINGS' (Absolute Maximum)

Impact Acceleration .................. 450 G
Uniform Acceleration ................ 1000 G
Fatigue (Vibrational Acceleration for Extended Periods) 2.5 G
Bulb Temperature ........................ 125°C C Max.
.................................. -55°C C Min.
Altitude2 ................................ 80000 Ft.

ELECTRICAL DATA

HEATER CHARACTERISTICS

Min.  Bogey  Max.
Heater Voltage ........................ 6.0  6.3  6.6 V
Heater Current ........................ 150 mA

DIRECT INTERELECTRODE CAPACITANCES

Shielded9  Unshielded
Grid No. 1 to Anode .................. 0.08  0.11 µuf
Grid No. 1 to All Other Electrodes . 1.70  1.60 µuf
Anode to All Other Electrodes ...... 1.60  1.50 µuf

RATINGS' x 2 (Absolute Maximum — Except as Noted)

Absolute Minimum Cathode Heating Time ........ 10 Seconds
Peak Forward Anode Voltage ............... 500 v
Peak Inverse Anode Voltage ............... 500 v
Negative Grid No. 1 Voltage
Before Conduction ..................... 200 Vdc
During Conduction ................... 10 Vdc
Negative Grid No. 2 Voltage
Before Conduction ..................... 100 Vdc
During Conduction ................... 10 Vdc
Cathode Current ........................ 16 mAdc
Peak Plate Current8 ................... 100 ma
Peak Heater-Cathode Voltage
Heater Positive with Respect to Cathode .... 25 v
Heater Negative with Respect to Cathode ... 100 v
Grid No. 1 Resistor .................. 10 Meg

CHARACTERISTICS

Tube Voltage Drop for Ib = 20 mAdc ........ 10 Vdc

TYPICAL OPERATING CONDITIONS

Anode Voltage .......................... 150 Vac
Grid No. 2 Voltage7 ................... 0 Vac
Grid No. 1 Voltage8 ................... 5.0 Vac
Peak Grid No. 1 Signal Voltage ........ 5.0 v
Anode Resistor ......................... 3750 Ohms
Grid No. 1 Resistor .................. 1.0 Meg

NOTES:

1. Limitations beyond which normal tube performance and tube life may be impaired.
2. If altitude rating is exceeded, reduction of instantaneous voltages (Ef excluded) may be required.
3. Tube life and reliability of performance are directly related to the degree of regulation of the heater voltage to its center rated value of 6.3 volts.
4. External shield of 0.015 inch diameter connected to cathode.
5. Values shown are as registered with RETMA.
6. Averaged over three seconds maximum.
7. The No. 2 grid shall not be used for control purposes.
8. Bias voltage, 180° out of phase with anode voltage.

Sylvania Electric Products Inc.
RADIO TUBE DIVISION
EMPORIUM, PA.
Prepared and Released By The TECHNICAL PUBLICATIONS SECTION
EMPORIUM, PENNSYLVANIA
FEBRUARY 1957 PAGE 1 OF 9
## ACCEPTANCE CRITERIA

### Test Conditions

<table>
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<th>Value</th>
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<td>Heater Voltage</td>
<td>6.3 V</td>
</tr>
<tr>
<td>Grid No. 2 Voltage</td>
<td>0 V</td>
</tr>
<tr>
<td>Heater-Cathode Voltage</td>
<td>0 V</td>
</tr>
</tbody>
</table>

For the purposes of inspection, use applicable reliable paragraphs of MIL-E-1 and Inspection Instructions for Electron Tubes.

### MIL-E-1 Ref. Test | MIL-E-1 Ref. Test | MIL-E-1 Ref. Test | MIL-E-1 Ref. Test |
<table>
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<td>4.10.8 Heater Current:</td>
<td>4.10.15 Heater-Cathode Leakage:</td>
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<td>4.10.8 Heater Current:</td>
<td>0.65</td>
<td>140</td>
<td>150</td>
</tr>
<tr>
<td>4.10.15 Heater-Cathode Leakage:</td>
<td>0.65</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>4.10.17.1 Grid Voltage (1):</td>
<td>0.65</td>
<td>-2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>4.10.17.1 Grid Voltage (2):</td>
<td>0.65</td>
<td>-2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td>4.10.17.2 Anode Voltage:</td>
<td>0.65</td>
<td>26</td>
<td>Vdc</td>
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<tr>
<td>4.7.5. Continuity and Shorts (Inoperatives):</td>
<td>0.4</td>
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<tr>
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<td>Envelope (8-1)</td>
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<td><strong>Measurements Acceptance Tests, Part 2</strong></td>
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<td>4.10.24 Pulse Emission:</td>
<td>2.5</td>
<td>76</td>
<td>v</td>
</tr>
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<td>4.9.20.3 Vibration:</td>
<td>No Voltages; Post Shock and Fatigue Test</td>
<td>10.0</td>
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<td>2.5</td>
<td>4</td>
<td>arcs</td>
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<tr>
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<td>Hammer Angle = 30°</td>
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<td></td>
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<tr>
<td>4.9.20.6 Fatigue:</td>
<td>Fixed Frequency; $F = 25 \text{ min.}, 60 \text{ max.}$</td>
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<tr>
<td>4.9.6.3 Glass Strain:</td>
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### ACCEPTANCE CRITERIA (Continued)

<table>
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<th>Allowable Defects per Characteristic</th>
<th>Limits</th>
<th>Units</th>
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<td></td>
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<td>Combined Samples</td>
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<tr>
<td>4.11.7</td>
<td>Heater Cycling Life Test:</td>
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<td>2.5</td>
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<tr>
<td></td>
<td>$E_f = 7.0 , \text{V}$; $1$ min. on, $4$ min. off; $E_b = E_{c1} = E_{c2} = 0 , \text{V}; , E_{hk} = 18 , \text{Vac}$</td>
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<tr>
<td>4.11.3.1</td>
<td>Survival Rate Life Test: (100 Hours)</td>
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<tr>
<td></td>
<td>Notes 2 and 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$I_b = 16 , \text{mA}; , I_b = 100 , \text{ma}; , R_{g1} = 50,000 , \Omega$</td>
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<tr>
<td></td>
<td>$I_{p} = 300 , \text{Vac}; , E_{hk} = 100/25 , \text{Vdc};$</td>
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<td></td>
<td>$R_{p} = 5000 , \Omega$</td>
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<td>4.11.4</td>
<td>Survival Rate Life Test End Points: Continuity and Shorts (Inoperatives)</td>
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<td>0.65</td>
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<tr>
<td>4.11.3.1</td>
<td>Intermittent Life Test: Notes 2, 4 and 5</td>
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<tr>
<td>4.11.5</td>
<td>Survival Rate Life Test, tk = 10 sec max.; $T_{envelope} = +125^\circ \text{C}$ min.;</td>
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<tr>
<td>4.11.3.1</td>
<td>Intermittent Life Test End Points: (500 Hours)</td>
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<tr>
<td>4.11.4</td>
<td>Inoperatives</td>
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<tr>
<td></td>
<td>$I_{heater}$</td>
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<td>Grid Voltage (1)</td>
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<tr>
<td></td>
<td>Anode Voltage</td>
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<tr>
<td></td>
<td>Pulse Emission</td>
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<td>2</td>
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<tr>
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<td>Heater-Cathode Leakage</td>
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<td>2</td>
</tr>
<tr>
<td></td>
<td>Heater Positive</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Heater Negative</td>
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</tr>
<tr>
<td></td>
<td>Total Defectives</td>
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<td></td>
<td>4</td>
</tr>
</tbody>
</table>

### ACCEPTANCE CRITERIA NOTES:

1. The AQL for the combined defectives for attributes in Measurements Acceptance Tests, Part 1, excluding inoperatives and mechanical, shall be one percent. A tube having one or more defects shall be counted as one defective.

2. Phase of grid voltage shall be adjusted to provide start of conduction at the peak of the applied anode voltage.

3. Tubes subjected to the following destructive tests are not to be accepted under this specification.
   - 4.9.5.3 Subminiature lead fatigue
   - 4.9.20.5 Shock
   - 4.9.20.6 Fatigue

4. 4.11.7 Heater cycling life test
4. 4.11.5 Intermittent life test

4. Envelope temperature is defined as the highest temperature indicated when using a thermocouple of # 40 BS or smaller diameter elements welded to a ring of 0.025 inch diameter phosphor bronze in contact with the envelope. Envelope temperature requirement will be satisfied if a tube, having hogey lb (±5%) under normal test conditions, is determined to operate at maximum specified temperature at any position on the life test rack.

5. 5: Cycling shall be 30 seconds positive voltage and 30 seconds negative voltage.

### APPLICATION DATA

The 5643 is a Premium Subminiature tetrode thyatron designed for use in counters, grid-controlled rectifiers and other control circuits. This tube has a control characteristic which is virtually independent of ambient temperature over a comparatively wide range.

The No. 1 grid circuit resistance may be as high as 10 megohms, if required to obtain maximum signal from a high impedance source. When this high resistance is used, the tube base must be kept clean and dry to reduce leakage currents to a minimum. If a socket is used, precautions must also be taken to keep socket leakage to a minimum. When a high No. 1 grid resistance is used with a c anode voltage, the grid-anode circuit capacitance should be reduced as much as possible to prevent erratic firing due to line voltage surges. For the usual application, it is recommended that lower values of grid resistance be employed. Values as low as 0.1 megohm are satisfactory for many applications.

As is customary for all gas tubes using oxide-coated cathodes, certain precautions must be observed. To prevent damage to the cathode, the heater voltage must not deviate more than ±5% from the rated value. Low voltage operation reduces cathode temperature and results in cathode sputtering, hot spots and eventual destruction of the cathode. Higher cathode temperatures, due to increased heater voltage, can cause erratic firing voltages.
APPLICATION DATA (Continued)

At least 10 seconds should be allowed to permit the cathode to reach normal operating temperature before anode voltage is applied.

Whenever possible, it is recommended that no difference of potential exist between cathode and heater. In circuits where the cathode is not directly connected to the heater, the potential difference between them should not exceed recommended peak values shown in the tabulated data.

The 5643 is designed to provide long life and stable operation under conditions of severe shock, vibration, high altitude and high temperature. The 5643 is manufactured and inspected to meet the applicable MIL-E-1 specification for reliability. Life expectancy is described by the life tests specified on the attached pages and/or individual MIL-E-1 specifications. The actual life expectancy of the tubes in an operating circuit is affected by both the operating and environmental conditions involved. Likewise, the life tests specified indicate performance under certain operating criteria to a set of specified end points. Performance at conditions other than those specified can usually be estimated only roughly as giving better or poorer life expectancy. For further discussion of life expectancy, reference should be made to the frontal section of this manual.

The information presented on this data sheet is furnished without assuming any obligation.

AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION

![Graph showing average grid characteristics before anode conduction]

\[ E_f = \text{RATED VALUE} \]
\[ E_{C2} = 0 \text{ VOLTS} \]
\[ R_{CL} = 0 \text{ OHMS} \]
AVERAGE IONIZATION CHARACTERISTICS

\[ E_f = \text{RATED VALUE} \]
\[ E_g = 100 \text{ VOLTS} \]
\[ E_{C2} = 0 \text{ VOLTS} \]

AVERAGE REGULATION CHARACTERISTICS

GRID NO. 1 AND
GRID NO. 2
TIED TO CATHODE

\[ R_b = 4 \text{ KILOHMS} \]
AVERAGE DEIONIZATION CHARACTERISTICS

Anode reignition voltage vs. microseconds after extinction.

Parameters:
- $E_f =$ RATED VALUE
- $E_{Cl} =$ -10 VOLTS
- $R_{Cl} =$ 1000 OHMS
- GRID NO. 2 TIED TO CATHODE

AVERAGE GRID CHARACTERISTICS BEFORE ANODE CONDUCTION

DC grid No. 1 voltage vs. DC grid No. 1 current in mA.

Parameters:
- $E_f =$ RATED VALUE
- $R_{Cl} =$ 0 OHMS
- GRID NO. 2 TIED TO CATHODE
OPERATIONAL RANGE OF CRITICAL GRID VOLTAGE

$E_1 = \text{RATED VALUE}$
$E_{C2} = 0 \text{ VOLTS}$

The ranges shown take into account initial differences between individual tubes and subsequent differences during tube life for a heater voltage range of 6.0 to 6.6 volts and for a bulb temperature range of -55 to +160°C.

(DC ANODE VOLTAGE = $\sqrt{2}$ AC ANODE VOLTAGE)
$E_f = \text{RATED VALUE}$
$R_p = 10000 \ \text{OHMS}$
GRID NO. 2
TIED TO CATHODE