RCA-6405/1640 is a gas phototube designed for use in industrial applications critical to microphonics and sensitivity gradient. Among such applications are electronic and solutions for inspection equipment and ammud inspection equipment.

Having high sensitivity to red and near infrared radiant energy, the 6405 is especially suitable for use with an incandescent light source.

The 6405 is provided with a non-hygrosopic base which insures a value of resistance between anode and cathode pins about 10 times higher than conventional bases under adverse operating conditions of high humidity. As a result, more output for a given light input is obtainable under high-humidity conditions.

**DATA**

**General:**
- Spectral Response: 5-1
- Wavelength of Maximum Response: 8000 ± 1000 angstroms
- Shape: Semi-cylindrical
- Minimum Projected Length*: 1-1/4"
- Minimum Projected Width*: 5/8"
- Direct Inter-electrode Capacitance: 3 μF
- Overall Length: 4-5/16" ± 1/8"
- Seated Length to Center of Cathode: 2-1/8" ± 3/32"
- Maximum Diameter: 1-1/8"
- Build: 1-8 Base: Dwarf-Shell Small 4-Pin (JETEC No. Aa-26), Non-hygrosopic
- Mounting Position: Any
- Weight (Approx.): 1.3 oz

**Maximum Ratings, Absolute Values:**

<table>
<thead>
<tr>
<th>Characteristics at 90 Volts on Anode:</th>
<th>Min.</th>
<th>Av.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity: Radiant at 8000 angstroms</td>
<td>0.0135</td>
<td>μamp/μwatt</td>
<td></td>
</tr>
<tr>
<td>Luminous: At 0 cps</td>
<td>80</td>
<td>135</td>
<td>200 μamp/lumen</td>
</tr>
<tr>
<td>At 5000 cps</td>
<td>116</td>
<td>μamp/lumen</td>
<td></td>
</tr>
<tr>
<td>At 10000 cps</td>
<td>100</td>
<td>μamp/lumen</td>
<td></td>
</tr>
<tr>
<td>Sensitivity Difference Between Highest and Lowest Value Along Cathode Length*:</td>
<td>–</td>
<td>25 μamp/lumen</td>
<td></td>
</tr>
<tr>
<td>Gas Amplification Factor</td>
<td>–</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Anode Dark Current: At 25°C</td>
<td>–</td>
<td>0.1 μamp</td>
<td></td>
</tr>
</tbody>
</table>

**Minimum Circuit Values:**

- With anode-supply voltage of 90 or less 90 volts

**DC-Load Resistance:**
- For dc currents above 5 μamp: 0.1 min. – megohm
- For dc currents below 5 μamp: 0 min. – megohm
- For dc currents above 3 μamp: 2.5 min. megohms
- For dc currents below 3 μamp: 0.1 min. megohm

* on plane perpendicular to indicated direction of incident light.

**Definitions**

- **Radiant Sensitivity.** The quotient of output current by incident radiant energy of a given wavelength, at constant electrode voltages.
- **Luminous Sensitivity.** The quotient of output current by incident luminous flux, at constant electrode voltages.
- **Electrode Dark Current.** The electrode current that flows when there is no radiant flux incident on the photocathode.

**Installation and Application**

The maximum ratings shown in the tabulated data are limiting values above which the service-ability of the 6405 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 responsi-
bility of determining an average design value for each rating below the absolute value of that 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. This rating should not be exceeded because too high a bulb temperature may cause the volatile cathode surface to evaporate with consequent decrease in the life and sensitivity of the tube.

The minimum dc load resistance values shown in the tabulated data are specified to prevent

Spectral Sensitivity Characteristic of Phototube Having S-1 Response. Curve is Shown for Equal Values of Radiant Flux at All Wavelengths.

If the voltage and current ratings of the 6405 are exceeded, a gas discharge may occur. This discharge is indicated by a faint blue glow within the tube. Once started, this discharge will continue independently of the illumination on the phototube. When a glow occurs, the anode-supply voltage should be disconnected immediately in order to prevent permanent damage to the tube.

The maximum ambient temperature as shown in the tabulated data is a tube rating which is to be observed in the same manner as other ratings.

Average Anode Characteristics of Type 6405.

A blue glow discharge. With the indicated values of load resistance, supply voltage, and maximum cathode current, the dc voltage drop across the load is large enough to protect the 6405.

The base pins of the 6405 fit the small 4-contact socket which should be positioned so that the two large pin openings (pins No.1 and No.4) are toward the light source. This position places the cathode so that light is intercepted by its concave surface.
Shielding of the 6405 and its leads to the amplifier is recommended when amplifier gain is high or when the phototube load resistance is high. Whenever frequency response is important in a phototube circuit, the leads from the phototube to the amplifier should be made short so as to minimize capacitance shunting of the phototube load. Since a phototube is a high-resistance device, it is important that insulation of associated circuit parts and wiring be adequate.

The operating stability of the 6405 is dependent on the magnitude of the luminous-flux input and its duration. When the 6405 is operated continuously at high values of light input, a drop in sensitivity (sometimes called fatigue) may be expected. The extent of the drop below the tabulated sensitivity values depends on the severity of the operating conditions. After a period of idleness, the 6405 like other gas phototubes usually recovers a substantial percentage of such loss in sensitivity.

When maximum stability is required, the use of a light input not exceeding 0.02 lumen is recommended.

Exposure to intense illumination, such as direct sunlight, may decrease the sensitivity of the 6405 even though no voltage is applied to the tube. The magnitude and duration of the decrease depend on the length of the exposure. Permanent damage to the tube may result if it is exposed to light so intense as to cause excessive heating of the cathode.

**DIMENSIONAL OUTLINE**

**SOCKET CONNECTIONS**

**Bottom View**

PIN 1: NO CONNECTION  
PIN 2: ANODE  
PIN 3: NO CONNECTION  
PIN 4: CATHODE

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