## RADECHON

**6499**

**CHARGE STORAGE TUBE**

**SINGLE-BEAM, BARRIER-GRID TYPE**

**NON-EQUILIBRIUM WRITING**

**CAPACITANCE-DISCHARGE READING**

### DATA

#### General:

- **Heater, for Unipotential Cathode:**
  - Voltage: 6.3 ac or dc volts
  - Current: 0.6 amp

- **Direct Interelectrode Capacitances (Approx.):**
  - Grid No.1 to all other electrodes: 9 μf
  - Deflecting electrode DJ₁ to all other electrodes: 13 μf
  - Deflecting electrode DJ₂ to all other electrodes: 13 μf
  - Deflecting electrode DJ₃ to all other electrodes: 11.5 μf
  - Deflecting electrode DJ₄ to all other electrodes: 11.5 μf
  - DJ₁ to DJ₂: 3 μf
  - DJ₂ to DJ₄: 3 μf
  - Grid No.5 to backing-electrode: 800 μf
  - Grid No.5 and backing-electrode to collector: 4 μf
  - Collector to all other electrodes & external cylindrical shield: See Curve

- **Focusing Method:** Electrostatic
- **Deflection Method:** Electrostatic
- **Overall Length:** 11-27/32" ± 3/8"
- **Greatest Diameter of Tube:** 3.30" ± 0.05"
- **Minimum Useful Storage-Surface Diameter:** 2-1/4"
- **Mounting Position:** Any except those positions where the diheptal base is up and the tube axis is at an angle of less than 60° from the vertical.

- **Weight (Approx.):** 1 lb

### Base:

- On large end of tube: Small-Button Twentyinar 8-Pin (JETEC No. E8-19)

### VIEW OF TWENTYINAR-BASE END OF TUBE

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Multiple Connections to Backing-Electrode, Only</td>
</tr>
<tr>
<td>6</td>
<td>One Need be Used</td>
</tr>
<tr>
<td>10</td>
<td>Pin 14</td>
</tr>
<tr>
<td>18</td>
<td>Pin 21 - No Connection</td>
</tr>
<tr>
<td>21</td>
<td>Pin 25 - No Connection</td>
</tr>
<tr>
<td>28</td>
<td>Pin 28 - Grid No.5</td>
</tr>
</tbody>
</table>

**PINS 2, 6, 10, 14, 18: ON 1-7/8" DIA., PIN CIRCLE**

**PINS 21, 25, 28: ON 7/8" DIA., PIN CIRCLE**

_SOLID-LINE CIRCLES DEPICT DIHEPTAL BASE; BROKEN-LINE CIRCLES DEPICT TWENTYINAR BASE_
On small end of tube. Small-Shell Diheptal 14-Pin (JETEC No.B14-45)

**VIEW OF DIHEPTAL-BASE END OF TUBE**

<table>
<thead>
<tr>
<th>Pin 1 - Heater</th>
<th>Pin 10 - Deflecting Electrode DJ₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 2 - Cathode</td>
<td>Pin 11 - Deflecting Electrode DJ₁</td>
</tr>
<tr>
<td>Pin 3 - Grid No.1</td>
<td>Pin 12 - No Connection</td>
</tr>
<tr>
<td>Pin 4 - Internal Connection-Do</td>
<td>Pin 13 - Same as Pin 4</td>
</tr>
<tr>
<td>Not Use</td>
<td>Pin 14 - Heater</td>
</tr>
<tr>
<td>Pin 5 - Grid No.3</td>
<td>C,CL - External Conductive Coating, Collector, Internal Shield, Flange between Neck and Large</td>
</tr>
<tr>
<td>Pin 6 - No Connection</td>
<td>Part of Tube</td>
</tr>
<tr>
<td>Pin 7 - Deflecting Electrode DJ₄</td>
<td></td>
</tr>
<tr>
<td>Pin 8 - Deflecting Electrode DJ₃</td>
<td></td>
</tr>
<tr>
<td>Pin 9 - Ultor (Grids No.2 &amp; No.4)</td>
<td></td>
</tr>
</tbody>
</table>

*All voltages are with respect to cathode unless otherwise specified.*

**Maximum Ratings, Absolute Values:**

**BACKING-ELECTRODE-TO-GRID-No.5 (BARRIER-GRID) VOLTAGE:**

- Backing-electrode positive with respect to grid No.5 ............ 100 max. volts
- Backing-electrode negative with respect to grid No.5 ............ 100 max. volts

**COLLECTOR-TO-GRID-No.5 VOLTAGE:**

- Positive value ............ 100 max. volts
- Negative value ............ 0 max. volts

**ULTOR® VOLTAGE ............ 1500 max. volts**

**GRID-No.3 VOLTAGE ............ 500 max. volts**

**GRID-No.1 VOLTAGE:**

- Negative bias value .......... 200 max. volts
- Positive bias value .......... 0 max. volts
- Positive peak value .......... 2 max. volts

**PEAK HEATER-CATHODE VOLTAGE:**

- Heater negative with respect to cathode .......... 125 max. volts
- Heater positive with respect to cathode .......... 10 max. volts

**Equipment Design Ranges:**

*For any ultor voltage ($R_{c4}$) between 1000 and 1500 volts*

**Back**-

**Grid-No.5 Voltage... See Note 1**

Note 1: The "ultor" in a storage tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 6499, the ultor function is performed by grid No.4. Since grid No.4 and grid No.2 are connected together within the 6499, they are collectively referred to simply as "ultor" for presenting data.

*: See next page.
<table>
<thead>
<tr>
<th>Collector-to-Grid-No.5 Voltage</th>
<th>0 to 50 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.3 Voltage for Focus with grid- No.1 volts = 0</td>
<td>14% to 26% of $E_C$</td>
</tr>
<tr>
<td>Grid-No.1 Voltage for collector-current cutoff</td>
<td>-2.5% to -4.7% of $E_C$</td>
</tr>
<tr>
<td>Collector Current for grid-No.1 volts = 0</td>
<td>20 to 50 μamp</td>
</tr>
<tr>
<td>Max. Cathode Current for grid-No.1 volts = 0</td>
<td>See Curve</td>
</tr>
<tr>
<td>Deflection Factors: DJ$_1$ and DJ$_2$.</td>
<td>85 to 105 v dc/in./kv of $E_C$</td>
</tr>
<tr>
<td>DJ$_3$ and DJ$_4$.</td>
<td>78 to 96 v dc/in./kv of $E_C$</td>
</tr>
<tr>
<td>Spot Position.</td>
<td>See Note 2</td>
</tr>
<tr>
<td>Signal-Uniformity Ratio.</td>
<td>See Note 3</td>
</tr>
</tbody>
</table>

**Examples of Use Design Ranges:**

**For Ulterior Voltage of 1000 volts**

<table>
<thead>
<tr>
<th>Grid-No.3 Voltage for Focus with grid- No.1 volts = 0</th>
<th>140 to 260 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid-No.1 Voltage for collector-current cutoff</td>
<td>-25 to -47 volts</td>
</tr>
<tr>
<td>Deflection Factors: DJ$_1$ and DJ$_2$.</td>
<td>85 to 105 v dc/in.</td>
</tr>
<tr>
<td>DJ$_3$ and DJ$_4$.</td>
<td>78 to 96 v dc/in.</td>
</tr>
</tbody>
</table>

**Maximum Circuit Values:**

<table>
<thead>
<tr>
<th>Grid-No.1-Circuit Resistance</th>
<th>1.5 max. megohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance in Any Deflecting- Electrode Circuit</td>
<td>1.0 max. megohm</td>
</tr>
</tbody>
</table>

* In general, the recommended minimum ulterior voltage should not be less than 1000 volts. Signal output and resolution decrease with decreasing ulterior voltage. Secondary emission characteristics of the dielectric layer limit the maximum ulterior voltage to 1500 volts.

# It is recommended that all deflecting-electrode-circuit resistances be approximately equal.

**Note 1:** The backing-electrode, grid No.5, and ulterior are usually operated at the same dc potential. During the writing cycle, the backing-electrode may be pulsed to ±60 volts with respect to grid No.5.

**Note 2:** The underflecting focused spot will fall within a circle having a diameter equal to 10% of the minimum storage-surface diameter and having its center coincident with the center of the storage surface. Spot position is calculated as follows: With heater voltage of 6.3 volts, ulterior voltage of 1000 volts, grid-No.5 voltage of 1000 volts, collector voltage of 1050 volts, grid-No.3 voltage adjusted to give focus, grid-No.1 voltage adjusted for 15 microamperes peak collector current, each deflecting electrode connected through a 1-megohm resistor to ulterior, and the tube shielded from all extraneous fields, the voltages

**Note 3:** See next page.
required to displace the beam from its undeflected position to the
edge of the storage surface in the direction of each deflecting
electrode are recorded as a for DJ1, b for DJ2, c for DJ3, and d
for DJ4.

Spot Position in % of Storage-Surface Diameter

\[
\frac{1}{2} \sqrt{(b-a)^2 + (d-c)^2} \times 100
\]

Note 3: With voltages as specified in Note 2, and with a signal written
into storage by applying a series of well-formed symmetrical square
waves to grid No. 1 such that a series of 25 equally spaced stored
elements are written across a single line scan, the ratio of the
maximum to minimum signal amplitude observed as the single line scan
is moved across the storage surface will not exceed 1.35.

OPERATING CONSIDERATIONS

Shielding. The use of a magnetic shield of high-permeability
material surrounding the tube is recommended. This shield
prevents the effect of stray fields in causing unwanted
deflection of the electron beam.
NOTE 1: THE ANGLE BETWEEN PLANE THROUGH PIN 6 OF TWENTY-NINAR BASE AND TUBE AXIS, AND PLANE THROUGH PIN 2 OF DIHEPTAL BASE AND TUBE AXIS WILL NOT EXCEED 100°. THE INDICATED PINS ARE BOTH ON THE SAME SIDE OF THE TUBE.

NOTE 2: DEFLECTING ELECTRODES DJ₁ & DJ₂ ARE NEARER THE TARGET. DEFLECTING ELECTRODES DJ₃ & DJ₄ ARE NEARER THE DIHEPTAL BASE.

NOTE 3: ANGLE BETWEEN DJ₁ & DJ₂ DEFLECTION PATH AND DJ₃ & DJ₄ DEFLECTION PATH IS 900° ± 30°.

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RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
RESOLUTION CHARACTERISTICS

$E_f = 6.3$ VOLTS
GRID-N85 VOLTS = ULTOR VOLTS = 1000
COLLECTOR VOLTS = 1050
GRID-N83 VOLTS = ADJUSTED FOR BEST OVERALL FOCUS
GRID-NR1 VOLTS = ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR CURRENT SHOWN ON EACH CURVE
BACKING-ELECTRODE:
DURING WRITING — PULSED APPROX. 50 VOLTS POSITIVE WITH RESPECT TO ULTOR
DURING READING — AT GRID-N85 POTENTIAL
RESOLUTION CHARACTERISTICS

E_c = 6.3 VOLTS
GRID-N°5 VOLTS = ULTOR VOLTS
COLLECTOR VOLTS = ULTOR VOLTS + 50 VOLTS
GRID-N°3 VOLTS — ADJUSTED FOR BEST OVERALL FOCUS
GRID-N°1 VOLTS — ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR
CURRENT OF 7.5 MICROAMPERES
BACKING-ELECTRODE:
DURING WRITING — PULSED APPROX. 50 VOLTS POSITIVE WITH
RESPECT TO ULTOR
DURING READING — AT GRID-N°5 POTENTIAL
TYPICAL TARGET CHARACTERISTICS

$E_x = 6.3 \text{ VOLTS}$
GRID-N$\#5$ VOLTS = ULTOR VOLTS = 1000
COLLECTOR VOLTS = 1050
GRID-N$\#3$ VOLTS - ADJUSTED FOR BEST OVERALL FOCUS
GRID-N$\#1$ VOLTS - ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR
CURRENT OF 15 MICROAMPERES
STORAGE SURFACE IS AT EQUILIBRIUM POTENTIAL PRIOR TO
APPLICATION OF PULSE

INSTANTANEOUS NET TARGET MICROAMPERES

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APPROXIMATE
DISCHARGE-FACTOR CHARACTERISTIC

$E_f = 6.3 \text{ VOLTS}$
GRID-N°5 VOLTS = ULTOR VOLTS = 1000
COLLECTOR VOLTS = 1050
GRID-N°3 VOLTS -- ADJUSTED FOR BEST OVERALL FOCUS
GRID-N°1 VOLTS -- ADJUSTED TO GIVE EQUILIBRIUM COLLECTOR
CURRENT OF 15 MICROAMPERES
STORAGE SURFACE IS AT EQUILIBRIUM POTENTIAL PRIOR TO
APPLICATION OF PULSE
SWEEP SPEED = 0.012 INCH/$\mu$SEC

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DIAGRAM
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92CM-8960