RCA-24HP4 is a very short, directly viewed, rectangular, glass picture tube of the low-voltage electrostatic-focus and magnetic-deflection type. It has a spherical Filterglass faceplate, an aluminized screen 21-7/16" x 16-7/8" with slightly curved sides and rounded corners and a minimum projected screen area of 332 square inches. The 24HP4 has a neck diameter of only 1-1/8" which not only makes possible the use of a deflecting yoke having high deflection sensitivity but also permits deflection of the beam through the wide deflection angle with only slightly more power than is required to scan a tube with 90° deflection angle.

The 24HP4 utilizes a new electron gun of the "straight" type designed to minimize deflection distortion. This new electron gun eliminates the need for an ion-trap magnet.

Another design feature of the 24HP4 is an integral glass-button base having straight-through leads fitted with an indexing plug. This basing arrangement eliminates any possibility of loose base-pin connections. In addition, the 24HP4 has an external conductive bulb coating which with the internal conductive coating forms a supplementary filter capacitor.

**DATA**

**General:**

Heater, for Unipotential Cathode:

- Voltage (AC or DC) ........... 6.3 volts
- Current ....................... 0.6 ± 10% amp

Direct Inter electrode Capacitances:

- Grid No. 1 to all other electrodes ........ 6 µuf
- Cathode to all other electrodes ........ 5 µuf
- External conductive coating to ulcer* .... 2500 max. µuf
- 2000 min. µuf

Faceplate, Spherical .................. Filterglass
Light transmission (Approx.) ............... 76%
Phosphor .................................. P₄—Sulfide Type, Aluminized
Fluorescence ................................. White
Phosphorescence .............................. White
Persistence ................................ Short
Focusing Method ............................ Electrostatic
Deflection Method .......................... Magnetic
Deflection Angles (Approx.):
  - Diagonal .......................... 110°
  - Horizontal ....................... 105°
  - Vertical .......................... 87°

Electron Gun Type Requiring No Iron-Trap Magnet

**Tube Dimensions:**

- Overall length .................. 15-7/8" ± 1/16"
- Greatest width .................. 22-11/16" ± 1/8"
- Greatest height .................. 18-1/2" ± 1/8"
- Diagonal ....................... 24" ± 1/8"
- Neck length .................. 5-7/16" ± 1/8"
GRID-DRIVE® SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode.

**Maximum Ratings, Design-Center Values:**

<table>
<thead>
<tr>
<th>ULTOR® Voltage</th>
<th>190000 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRID-No. 4 Voltage:</td>
<td>190000 min. volts</td>
</tr>
<tr>
<td>Positive value</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>Negative value</td>
<td>500 max. volts</td>
</tr>
<tr>
<td>GRID No. 2 Voltage:</td>
<td>500 max. volts</td>
</tr>
<tr>
<td>Positive value</td>
<td>200 max. volts</td>
</tr>
<tr>
<td>Negative value</td>
<td>140 max. volts</td>
</tr>
<tr>
<td>Positive peak value</td>
<td>120 max. volts</td>
</tr>
<tr>
<td>Negative peak value</td>
<td>80 max. volts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>4 max. volts</td>
</tr>
<tr>
<td>Heater negative with respect to cathode:</td>
<td>During equipment warm-up period not exceeding 15 seconds.</td>
</tr>
<tr>
<td>After equipment warm-up period</td>
<td>180 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode:</td>
<td>180 max. volts</td>
</tr>
</tbody>
</table>

**Equipment Design Ranges:**

With any ultor-to-grid No. 1 voltage (E <sub>Ck</sub>) between 12000 and 20000 volts and grid-No. 2 voltage (E <sub>Ck2</sub>) between 200 and 500 volts:

- GRID-No. 4 Voltage for Focus: \[ -50 \text{ to } +350 \text{ volts} \]
- GRID-No. 1 Voltage (E <sub>Ck</sub>) for Visual Extinction of Focused Raster: \[ -25 \text{ to } +25 \text{ volts} \]
- GRID,No. 2 Voltage: \[ -15 \text{ to } +15 \text{ volts} \]
- Field Strength of Adjustable Centering Magnet*: \[ 0 \text{ to } 8 \text{ gausses} \]

**Examples of Use of Design Ranges:**

- WITH ULTOR-TO-GRID NO. 1 VOLTAGE: \[ 14000 \text{ to } 16000 \text{ volts} \]
- AND GRID NO. 2 VOLTAGE: \[ 300 \text{ to } 400 \text{ volts} \]

**Maximum Circuit Values:**

- GRID-No. 1-Circuit Resistance: \[ 1.5 \text{ max. megohms} \]

CATHODE-DRIVE® SERVICE

Unless otherwise specified, voltage values are positive with respect to grid No. 1.

**Maximum Ratings, Design-Center Values:**

<table>
<thead>
<tr>
<th>ULTOR® - TO - GRID-No. 1 Voltage:</th>
<th>20000 max. volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRID-No. 4 Voltage:</td>
<td>12000 min. volts</td>
</tr>
<tr>
<td>Positive value</td>
<td>1000 max. volts</td>
</tr>
<tr>
<td>Negative value</td>
<td>500 max. volts</td>
</tr>
<tr>
<td>GRID-No. 2 Voltage:</td>
<td>500 max. volts</td>
</tr>
<tr>
<td>Positive value</td>
<td>200 max. volts</td>
</tr>
<tr>
<td>Negative value</td>
<td>140 max. volts</td>
</tr>
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</tr>
<tr>
<td>Negative peak value</td>
<td>80 max. volts</td>
</tr>
<tr>
<td>PEAK HEATER-CATHODE VOLTAGE:</td>
<td>4 max. volts</td>
</tr>
<tr>
<td>Heater negative with respect to cathode:</td>
<td>During equipment warm-up period not exceeding 15 seconds.</td>
</tr>
<tr>
<td>After equipment warm-up period</td>
<td>180 max. volts</td>
</tr>
<tr>
<td>Heater positive with respect to cathode:</td>
<td>180 max. volts</td>
</tr>
</tbody>
</table>

**Equipment Design Ranges:**

With any ultor-to-grid No. 1 voltage (E <sub>Ck</sub>) between 12000 and 20000 volts and grid-No. 2-to-grid-No. 1 voltage (E <sub>Ck2</sub>) between 225 and 500 volts:

- GRID-No. 4 Voltage for Focus: \[ -50 \text{ to } +350 \text{ volts} \]
- Cathode-to-Grid-No. 1 Voltage (E <sub>Ck1</sub>) for Visual Extinction of Focused Raster: See Patter-Cutoff-Range Chart for Cathode-Drive Service
- Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black Level): White-level value (Peak negative): \[ -25 \text{ to } +25 \text{ volts} \]
- GRID-No. 4 Current: \[ -15 \text{ to } +15 \text{ milliamps} \]
- Field Strength of Adjustable Centering Magnet*: \[ 0 \text{ to } 8 \text{ gausses} \]

**Examples of Use of Design Ranges:**

- WITH ULTOR-TO-GRID No. 1 VOLTAGE: \[ 14000 \text{ to } 16000 \text{ volts} \]
- AND GRID No. 2-TO-GRID No. 1 VOLTAGE: \[ 300 \text{ to } 400 \text{ volts} \]

**Maximum Circuit Values:**

- GRID-No. 1-Circuit Resistance: \[ 1.5 \text{ max. megohms} \]

- The "ulator" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons through the beam prior to its deflection. In the 24AHP, the ulator function is performed by grid No. 5. Since grid No. 5, grid No. 3, and collector are connected together within the 24AHP, they are collectively referred to simply as "ulator" for convenience in presenting data and curves.

- Grid drive is the operating condition in which the video signal varies the grid-No. 1 potential with respect to cathode.

- This value is a working design-center minimum. The equivalent absolute minimum ulator, or ultor-to-grid-No. 1 voltage, is 11000 volts, below which the switching capability of the 24AHP will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ulator, or ultor-to-grid-No. 1 voltage, is never less than 11000 volts.
§ The grid-No. 4 voltage or grid-No. 4-to-grid-No. 1 voltage required for focus of any individual tube is independent of ulti-or current and will remain essentially constant for values of ulti-or voltage (or ulti-or-to-grid-No. 1 voltage) or grid-No. 2 voltage (or grid-No. 2-to-grid-No. 1 voltage) within design ranges shown for these items.

* Distance from Reference Line for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 7/16-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.

Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No. 1 and the other electrodes.

**OPERATING CONSIDERATIONS**

The maximum ratings in the tabulated data are working design-center maximums established according to the standard design-center system of rating electron tubes. Tubes so rated will give satisfactory performance in equipment designed so that these maximum ratings will not be exceeded when the equipment is operated from ac or dc power-line supplies whose normal voltage including normal variations falls within ± 10 per cent of line-center voltage value of 117 volts.

**X-Ray Warning.** When operated at ulti-or voltages up to 16 kilovolts, the 24AHP4 does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (absolute maximum value), shielding of the 24AHP4 for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

**Shatter-Proof Cover Over the Tube Face.** Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 24AHP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

The base pins of the 24AHP4 fit the Eightar 8-contact socket, such as Ucinite Part No. 115446, or equivalent. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins.
**Fig. 1** - Raster-Cutoff Range for Type 24AEP4 in Grid-Drive Service.

**Fig. 2** - Raster-Cutoff Range for Type 24AEP4 in Cathode-Drive Service.
Fig. 3 - Average Drive Characteristics of Type 24AHP4.

Fig. 4 - Average Drive Characteristics of Type 24AHP4.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO.126 AND WITH TUBE SITTING IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFF WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/8".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/16", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROJECT MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 1" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.
REFERENCE LINE AND NECK-FUNNEL-COURENTOUR GAUGE

JETEC No. 126

REFERENCE LINE IS DETERMINED BY PLANE C-C'. WHEN GAUGE IS SEATED AGAINST FUNNEL.

Y = 0.58X^2 + 0.576"  
DIA.

Y AXIS

X AXIS

4°  

1.242" DIA.

5.000" .015" DIA.

4.500" .015" DIA.

4.250" DIA.

820" MAX.

0.886" .914" DIA.

0.083" .093"  

SEE DETAIL

.socket connections

Bottom View

8HR

PIN 1: HEATER
PIN 2: GRID No. 1
PIN 3: GRID No. 2
PIN 4: GRID No. 4
PIN 5: GRID No. 1
PIN 6: CATHODE
PIN 7: HEATER
CAP: ULTOR (Grid No. 3, Grid No. 5,
Collector)
C: EXTERNAL CONDUCTIVE COATING

NOTE 1: BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE BASE WILL FIT A FLAT-PLATE GAUGE HAVING A THICKNESS OF 3/8" AND EIGHT EQUALLY SPACED HOLES OF 0.0050" ± 0.0005" DIAMETER LOCATED ON A 0.600" ± 0.0005" DIAMETER CIRCLE. THE GAUGE IS ALSO PROVIDED WITH A CENTER HOLE TO PROVIDE 0.010" DIAMETRIC CLEARANCE FOR THE LUG AND KEY. PIN FIT IN THE GAUGE SHALL BE SUCH THAT THE ENTIRE LENGTH OF PINS WILL, WITHOUT UNDUE FORCE, ENTER INTO AND DISENGAGE FROM THE GAUGE.

NOTE 2: THIS DIMENSION AROUND THE PERIPHERY OF ANY INDIVIDUAL PIN MAY VARY WITHIN THE LIMITS SHOWN.

JETEC No.  

No. of Pins  
PINS

B8-181  
6-Pin  
1, 2, 3, 4, 5, 6, 7, 8

B7-182  
7-Pin Arrangement 1  
2, 3, 4, 5, 6, 7, 8

B7-183  
7-Pin Arrangement 2  
1, 2, 3, 4, 6, 7, 8