**Picture Tube**

**RECTANGULAR GLASS TYPE**
**LOW-VOLTAGE ELECTROSTATIC FOCUS**
**ALUMINIZED SCREEN**
**MAGNETIC DEFLECTION**
**With Heater Having Controlled Warm-Up Time**

**GENERAL DATA**

**Electrical:**
- Heater Current at 6.3 volts: 600 ± 30 ma
- Heater Warm-Up Time (Average): 11 seconds

**Direct Interelectrode Capacitances:**
- Grid No.1 to all other electrodes: 6 μμf
- Cathode to all other electrodes: 5 μμf
- External conductive coating to ultor: 2500 max. μμf
  1700 min. μμf

**Focusing Method:** Electrostatic
**Deflection Method:** Magnetic

**Deflection Angles (Approx.):**
- Diagonal: 114°
- Horizontal: 102°
- Vertical: 84°

**Electron Gun:** Type Requiring No Ion-Trap Magnet

**Optical:**
- Faceplate: Filterglass
- Light transmission at center (Approx.): 78%
- Phosphor (For curves, see front of this section): P4—Sulfide Type Aluminized
  White
- Fluorescence: White
- Phosphorescence: White
- Persistence: Medium Short

**Mechanical:**

**Tube Dimensions:**
- Overall length: 14–3/8" ± 5/16"
- Greatest width: 20–1/2" + 1/16" – 1/8"
- Greatest height: 16–1/2" ± 1/8"
- Diagonal: 23–25/64" + 3/32" – 1/8"
- Neck length: 5–1/8" ± 1/8"
- Curvature of faceplate (Radii):
  - Center: 50"
  - Intermediate: 36–3/4"
  - Edge: 24"

**Screen Dimensions (Minimum):**
- Greatest width: 19–1/4"
- Greatest height: 15–1/8"
- Diagonal: 22–5/16"
- Projected area: 282 sq. in.
- Weight (Approx.): 24 lbs
- Operating Position: Any
- Cap: Recessed Small Cavity (JEDEC No.J1–21)
- Bulb: J187 (114°)
Base. . . . . Small-Button Neoeightar 7-Pin, Arrangement 1, (JEDEC No.B7-20B)

Basing Designation for BOTTOM VIEW. . . . . . . . . . . . . . . . 8HR

Pin 1 - Heater
Pin 2 - Grid No.1 
Pin 3 - Grid No.2 
Pin 4 - Grid No.4 
Pin 6 - Grid No.1 
Pin 7 - Cathode 
Pin 8 - Heater

**GRID-DRIVE SERVICE**

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

**Maximum and Minimum Ratings, Design-Maximum Values:**

<table>
<thead>
<tr>
<th>ULTOR VOLTAGE</th>
<th>22000 max.</th>
<th>11000 min.</th>
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</table>

| GRID-No.4 (FOCUSBING) VOLTAGE: | | |
| Positive value | 1100 max. | |
| Negative value | 550 max. | |

| GRID-No.2 VOLTAGE | 550 max. | |
| 200 min. | |

| GRID-No.1 VOLTAGE: | | |
| Negative-peak value | 220 max. |
| Negative-bias value | 154 max. |
| Positive-bias value | 0 max. |
| Positive-peak value | 2 max. |

<table>
<thead>
<tr>
<th>HEATER VOLTAGE</th>
<th>6.9 max.</th>
<th>5.7 min.</th>
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</table>

**PEAK HEATER-CATHODE VOLTAGE:**

Heater negative with respect to cathode:

During equipment warm-up period | 450 max. |
| not exceeding 15 seconds |
| After equipment warm-up period | 200 max. |

Heater positive with respect to cathode | 200 max. |

**Equipment Design Ranges:**

With any ultror voltage ($E_{0k}$) between 11000 and 22000 volts
and grid-No.2 voltage ($E_{2k}$) between 220 and 550 volts

Grid-No.4 Voltage for focus | 0 to 400 |
| Grid-No.1 Voltage ($E_{1k}$) for visual extinction of focused raster | See Raster-Cutoff-Range Chart for Grid-Drive Service

Grid-No.1 Video Drive from Raster Cutoff (Black level):
White level value (Peak positive) | Same value as determined for $E_{1k}$ except video drive is a positive voltage
Grid-No.4 Current . . . . . . . . . . . . . -25 to +25 µa
Grid-No.2 Current . . . . . . . . . . . . . -15 to +15 µa
Field Strength of Adjustable
Centering Magnet* . . . . . . . . . . . . . 0 to 8 gausses

Examples of Use of Design Ranges:

With ultor voltage of
and grid-No.2 voltage of
Grid-No.4 Voltage for focus* . . . . . . . 0 to 400 volts
Grid-No.1 Voltage for visual
extinction of focused raster . . . . . . . -36 to -94 volts
Grid-No.1 Video Drive from
Raster Cutoff (Black level):
White-level value . . . . . . . . . . . . . 36 to 94 volts

Maximum Circuit Values:
Grid-No.1—Circuit Resistance . . . . . . . 1.5 max. megohms

CATHODE-DRIVE® SERVICE

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

Maximum and Minimum Ratings, Design—Maximum Values:

ULTOR-TO-GRID-No.1 VOLTAGE . . . . . . [22000 max. volts
GRID-No.4-TO-GRID-No.1 (FOCUSING) VOLTAGE:
Positive value . . . . . . . . . . . . . . . . 1250 max. volts
Negative value . . . . . . . . . . . . . . . . 400 max. volts
GRID-No.2-TO-GRID-No.1 VOLTAGE . . . . . [700 max. volts
GRID-No.2-TO-CATHODE VOLTAGE . . . . . . [350 min. volts
CATHODE-TO-GRID-No.1 VOLTAGE:
Positive-peak value . . . . . . . . . . . . . 220 max. volts
Positive-bias value . . . . . . . . . . . . . 154 max. volts
Negative-bias value . . . . . . . . . . . . . 0 max. volts
Negative-peak value . . . . . . . . . . . . . 2 max. volts
HEATER VOLTAGE . . . . . . . . . . . . . [6.9 max. volts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode:
During equipment warm-up period not exceeding 15 seconds . . . . . . 450 max. volts
After equipment warm-up period . . . . . . 200 max. volts
Heater positive with respect to cathode . . . . . . 200 max. volts

Equipment Design Ranges:

With any ultor-to-grid-No.1 voltage (Ec581) between 11000 and 22000 volts and grid-No.2-to-grid-No.1 voltage (Ec281) between 225 and 700 volts

Grid-No.4-to-Grid-No.1 Voltage for focus* . . . . . . . 0 to 400 volts

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
Cathode-to-Grid-No.1 Voltage
\( E_{k1} \) for visual extinction of focused raster. See Raster-Cutoff-Range Chart for Cathode-Drive Service

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):
White-level value (Peak negative) .............. Same value as determined for \( E_{k1} \) except video drive is a negative voltage

Grid-No.4 Current ..................... -25 to +25 µa
Grid-No.2 Current ..................... -15 to +15 µa
Field Strength of Adjustable Centering Magnet* .............. 0 to 8 gausses

Examples of Use of Design Ranges:
With ultor-to-grid-
No. 1 voltage of 18000 volts
and grid-No.2-to-
grid-No.1 voltage of 400 volts
Grid-No.4-to-Grid-No.1 Voltage for focus* .............. 0 to 400 volts
Cathode-to-Grid-No.1 Voltage for visual extinction of focused raster .................. 36 to 78 volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff (Black level):
White-level value ..................... -36 to -78 volts

Maximum Circuit Values:
Grid-No.1-Circuit Resistance ................ 1.5 max. megohms

\* Grid drive is the operating condition in which the video signal varies the grid-No.1 potential with respect to cathode.
\* Individual tubes will have satisfactory focus at some value of grid-No.4 (or grid-No.1-to-grid-No.1) voltage between 0 and 400 volts under conditions with the combined bias voltage and video-signal voltage adjusted to produce an ultor current of 200 microamperes.
\* 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 3/8-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 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

X-Ray Warning. When operated at ultor voltages up to 16 kilovolts, this picture tube does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 22 kilovolts (Design-maximum value), shielding of this picture tube 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 shatterproof, glass cover over the face of this picture tube 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.
SCREEN DIAGONAL 22.16 MIN.

SCREEN WIDTH 19.1/4 MIN.

15" R.
60" R.
62 3/4" R.
4 9/16" R.
48" R.
65 1/2" R.
2" R.

SCREEN HEIGHT 15 1/8 MIN.

20 1/2" + 1/16" (NOTE 6)
48" R.
30" R.
12"
.250"

2.02" ± 1/8"

REFERENCE LINE (NOTE 2)

SMALL-BUTTON NEOEIGHTAR 7-PIN BASE
ARRANGEMENT 1
JEDEC N"B7-208
(NOTE 3)

TRANSPARENT PROTECTIVE
COATING (OPTIONAL)

3.109"
1.125" + .031" - .025"

2.16"


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 CIRCUITRY CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 1-3/4".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

NOTE 5: TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: MEASURED AT THE MOLD-MATCH LINE.

NOTE 7: BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN 1/8", BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN 1/16" BEYOND THE ENVELOPE SURFACE AT THE LOCATION SPECIFIED FOR DIMENSIONING THE ENVELOPE WIDTH, DIAGONAL, AND HEIGHT.

NOTE 8: AREA BETWEEN MOLD-MATCH LINE AND SEAL BULGE IS 1/2" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND. SUPPORTS MUST BE SPACED FROM THE TUBE BY THE USE OF CUSHIONING PADS MADE OF ASPHALT, IMPREGNATED FELT OR EQUIVALENT.
BULB-CONTOUR DIMENSIONS

SHORT-SIDE VIEW

LONG-SIDE VIEW

REFERENCE LINE

Y AXIS

DIAGONAL VIEW

FOR THIS CONTOUR
\[ y = 0.75 x^2 + 0.5 \times x \]
(X, Y in inches)

NOTE: Planes A thru G are normal to the tube axis and at fixed locations from the Y axis. These coordinates describe the bogie-bulb external contour in planes through the tube axis and the respective faceplate axes.
Raster-Cutoff-Range Charts
Grid-Drive Service

\( E_f = 6.3 \text{ VOLTS} \)
ULTOR VOLTS = 11000 TO 22000
GRID-N\# 4 VOLTS ADJUSTED FOR FOCUS.

Cathode-Drive Service

\( E_f = 6.3 \text{ VOLTS} \)
ULTOR-TO-GRID-N\#1 VOLTS = 11000 TO 22000
GRID-N\# 4-TO-GRID-N\#1 VOLTS ADJUSTED FOR FOCUS.

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
E_c = 6.3 VOLTS
ULTOR-TO-GRID-N#1 VOLTS = 16000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID N#1 TO GIVE
FOCUSED RASTER CUTOFF.
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"

GRID-DRIVE SERVICE
E_c = 6.3 VOLTS
ULTOR VOLTS = 16000
GRID N#1 BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.
RASTER FOCUSED
AT AVERAGE BRIGHTNESS.
RASTER SIZE = 18" x 13½"
AVERAGE DRIVE CHARACTERISTICS

CATHODE-DRIVE SERVICE
E_F = 6.3 VOLTS
ULTOR-TO-GRID-NB1
VOLTS = 10000 TO 22000
CATHODE BIASED POSITIVE WITH
RESPECT TO GRID N#1 TO GIVE
FOCUSED RASTER CUTOFF.

GRID-DRIVE SERVICE
E_F = 6.3 VOLTS
ULTOR VOLTS = 11000 TO 22000
GRID N#1 BIASED NEGATIVE WITH
RESPECT TO CATHODE TO GIVE
FOCUSED RASTER CUTOFF.

CATHODE DRIVE
GRID DRIVE

ULTER MILLIAMPERES

VIDEO SIGNAL VOLTS FROM RASTER CUTOFF

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