Color Picture Tube

ULTRA-RECTANGULAR
4 X 3 Aspect Ratio

HI-LITE SCREEN
Blue-Gun-Down Operation

Electrical
Electron Guns, Three with Axes
Tilted Toward Tube Axis ......................... Red, Blue, Green
Heater, of Each Gun Series Connected within Tube with Each of the Other Two Heaters:
Current at 6.3 V .................................. 900 mA
Focusing Method .................................. Electrostatic
Focus Lens ........................................ Unipotential
Convergence Method .............................. Magnetic
Deflection Method ................................ Magnetic
Deflection Angles (Approx.):  
- Diagonal ........................................ 90 deg  
- Horizontal ..................................... 78 deg  
- Vertical ......................................... 60 deg  
Direct Interelectrode Capacitance (Approx.):  
- Grid No.1 of any gun to all other electrodes ..... 7.5 pF  
- Grid No.4 to all other electrodes ................ 6 pF  
- All cathodes to all other electrodes ............... 15 pF  
Capacitance Between Anode and External Conductive Coating ................. \{ \begin{align*} \text{2300 max. pF} \\ \text{1800 min. pF} \end{align*} \}  
Resistance Between Metal Hardware and External Conductive Coating .......... 50 M\Omega

Optical
Faceplate ........................................ Filterglass
- Light transmission at center (Approx.) ........... 53%  
- Surface ......................................... Polished
Screen ............................................. Aluminized
- Phosphor, rare-earth (red) sulfide (blue & green) .... P22  
- Persistence ...................................... Medium-Short  
Array ............................................. 382,000 Dot-Short  
Spacing between centers of adjacent dot trios (Approx.) ................ 0.024 in (0.61 mm)

Mechanical
Minimum Screen Area (Projected) ........ 185 sq in (1194 sq cm)
Bulb Panel Designation .................... JEDEC No.FP161-3/4 V1
Base Designation\textsuperscript{a} ........ Small-Button Diheptar 12-Pin
(JEDEC No.B12-244)
Basing Designation ......................... JEDEC No.14BH
Pin Position Alignment .................. Pin No.5 Aligns Approx. with Anode Bulb Contact

\textsuperscript{a} Base Designation refers to specific design considerations for the bulb and its connection points.

Electronic Components  DATA 1  2-72
Operating Position, preferred .... Anode Bulb Contact on Top
Gun Configuration .............................................. Delta
Weight (Approx.) ............................................. 25 lb (11.4 kg)
Implosion Protection
Type ............................................................... Banded

Maximum and Minimum Ratings, Design-Maximum Values
Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

Anode Voltage ................................................. \(22.5 \text{ max.} \ \text{kV}\)
Anode Current, Long-Term Average\(^b\) .................. \(1000 \text{ max.} \ \mu\text{A}\)
Grid-No.4 (Focusing Electrode) Voltage:
  Positive value ............................................... \(1100 \text{ max.} \ \text{V}\)
  Negative value ............................................... \(550 \text{ max.} \ \text{V}\)
Peak-Grid-No.2 Voltage,
Including Video Signal Voltage ......................... \(1000 \text{ max.} \ \text{V}\)
Grid-No.1 Voltage:
  Negative bias value ......................................... \(400 \text{ max.} \ \text{V}\)
  Negative operating cutoff value ......................... \(140 \text{ max.} \ \text{V}\)
  Positive bias value .......................................... \(0 \text{ max.} \ \text{V}\)
  Positive peak value ......................................... \(2 \text{ max.} \ \text{V}\)
Heater Voltage (ac or dc):\(^c\)
  Under operating conditions ............................... \(6.9 \text{ max.} \ \text{V}\)
  Under standby conditions \(^d\) .............................. \(5.7 \text{ min.} \ \text{V}\)
Heater-Cathode Voltage:
  Heater negative with respect to cathode:
    During equipment warm-up period not exceeding 15 seconds .......................... \(450 \text{ max.} \ \text{V}\)
    After equipment warm-up period:
      DC component value .................................... \(200 \text{ max.} \ \text{V}\)
      Peak value ............................................... \(200 \text{ max.} \ \text{V}\)
  Heater positive with respect to cathode:
    DC component value .................................... \(0 \text{ max.} \ \text{V}\)
    Peak value ............................................... \(200 \text{ max.} \ \text{V}\)

Equipment Design Ranges
Unless otherwise specified, values are for each gun and voltage values are positive with respect to cathode.

For anode voltages between 17 and 22.5 kV
Grid-No.4 (Focusing Electrode) Voltage ............ \(-75 \text{ to } 400 \ \text{V}\)
Grid-No.2 Voltage for Visual Extinction
of Undeflected Focused Spot . . . See CUTOFF DESIGN CHART
in Figure 3
At Grid No.1 voltage of \(-75 \text{ V}\) ....................... \(90 \text{ to } 270 \ \text{V}\)
At Grid No.1 voltage of -125 V .......................... 210 to 505 V
At Grid No.1 voltage of -140 V ......................... 245 to 580 V

Maximum Ratio of Grid-No.2 Voltages, Highest Gun to
Lowest Gun in Any Tube (At grid-No.1 spot cutoff
voltage of -100 V) ........................................... 1.86

Heater Voltage:

- Under operating conditions:
  - When standby operation is not utilized ................. 6.3 V
  - When 5.0-V standby operation is utilized ............. 6.0 V

- Under standby conditions .................................. 5.0 V

Grid-No.4 Current (Total) ................................ +±60 μA
Grid-No.2 Current .......................................... +±5 μA
Grid-No.1 Current .......................................... +±5 μA

To Produce White Light of ............................... 6550° K +
                                                      9300° K +
                                                      7 M.P.C.D.  27 M.P.C.D.

CIE Coordinates:

- X ........................................ 0.313  0.281
- Y ........................................ 0.329  0.311

Percentage of total anode current supplied by each gun (average):

- Red .......................................... 41  30  %
- Blue .......................................... 24  31  %
- Green ......................................... 35  39  %

Ratio of cathode currents:

- Red/blue:
  - Minimum ...................................... 1.35  0.75
  - Typical ..................................... 1.70  0.95
  - Maximum .................................... 2.20  1.25

- Red/green:
  - Minimum ..................................... 0.95  0.60
  - Typical .................................... 1.15  0.75
  - Maximum ................................... 1.70  1.10

- Blue/green:
  - Minimum ..................................... 0.50  0.60
  - Typical .................................... 0.70  0.80
  - Maximum ................................... 0.95  1.10

Displacements, Measured at Center of Screen:

- Raster centering displacement:
  - Horizontal ................................... ± 0.45 in (± 11.4 mm)
  - Vertical .................................... ± 0.45 in (± 11.4 mm)

- Lateral distance between the blue beam and
  the converged red and green beams .............. ± 0.25 in (± 6.4 mm)

- Radial convergence displacement excluding
  effects of dynamic convergence
  (each beam) ........................................... ± 0.37 in (± 9.4 mm)
Maximum Required Correction for Register
(Including Effect of Earth’s Magnetic Field when Using Recommended Components) as Measured at the Center of the Screen in any Direction 0.005 in (0.13 mm) max.

Typical Operation
Heater Voltage 6.3 V
Anode Voltage 20 kV
Grid-No.4 Voltage Adjusted for focus
Color Temperature 9300° K + 27 M.P.C.D.
Raster Size 15.922 x 11.941 in (404.42 x 303.30 mm)

Typical White-Light Output Measured within 4 in (102 mm) diameter area centered on tube face:

At anode current of 1000 µA 44 fL 151 Nit

Limiting Circuit Values
Low-Voltage Circuits:
  Effective grid-No.1-to-cathode-
circuit resistance (each gun) 0.75 max. MΩ

X-Radiation Characteristic:
Maximum Anode Voltage at which the X-radiation emitted will not exceed 0.5 mR/h at an anode current of 300 µA 33 kV

The X-radiation emitted from this picture tube, as measured in accordance with the procedure of JEDEC Publication No.64A will not exceed 0.5 mR/h throughout the useful life of the tube when operated within the Design-Maximum ratings: 27.5 kV anode voltage and 1000 µA anode current. The tube should not be operated beyond its Design-Maximum ratings stated above (such operation may shorten tube life or have other permanent adverse affects on its performance), but its X-radiation will not exceed 0.5 mR/h for anode voltage and current combinations given by the isodose-rate limit characteristics as shown in Figure 1. Operation above the values shown by the curve may result in failure of the television receiver to comply with the Federal Performance Standard for Television Receivers. Sub-Part C of Part 78 of Title 42, Code of Federal Regulations (PL90-602) as published in the Federal Register Vol.34, No. 247, Thursday, December 25, 1969. Maximum X-radiation as a function of anode voltage at 300 µA anode current is shown by the curve in Figure 2. X-radiation at a constant anode voltage varies linearly with anode current.

a The mating socket, including its associated, physically-attached hardware and circuitry, must not weigh more than one pound (one-half kilogram).

b The short-term average anode current should be limited by circuitry to 1500 microamperes.

c For maximum cathode life, it is recommended that the heater supply be regulated. The series impedance to any chassis con-
nection in the dc biasing circuit for the heater should be between 100 kilohms and 1 megohm. The surge voltage across the heater must be limited to 9.5 volts rms.

d The use of a 5-volt standby condition in conjunction with 6-volt operating conditions is recommended to improve the reliability of the color picture tube by extending the emission wear-out life and reducing other gun-related defects. A maximum heater voltage of 5.5 volts (Design-Maximum value) may be maintained on the color picture tube when the receiver is in the “off” (standby) position. All other voltages normally applied to the tube must be removed during standby operation.

e Register is defined as the relative position of the beam trios with respect to the associated phosphor-dot trios.

IMPORTANT: Refer to sheet Safety Precautions For Color Picture Tubes at front of this section.

Notes For Dimensional Outline

Note 1 – With tube neck inserted through flared end of reference-line and neck-funnel-contour gauge (JEDEC No.G162) and with tube seated in gauge, the reference line is determined by the intersection of the plane C-C’ of the gauge with the glass funnel.

Note 2 – Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base will fall within a 2-inch (51-mm) circle concentric with bulb axis.

Note 3 – The drawing shows the size and location of the contact area of the external conductive coating. The actual area of this coating will be greater than that of the contact area so as to provide the required capacitance. External conductive coating must be grounded with multiple contacts.

Note 4 – To clean this area, wipe only with soft, dry, lintless cloth.

SAGITTAL HEIGHTS AT POINTS \frac{125}{3.18} BEYOND EDGE OF MIN. SCREEN

\begin{align*}
\text{DIAGONAL} & : 1.485 \quad 37.72 \\
\text{WIDTH} & : 1.044 \quad 26.52 \\
\text{HEIGHT} & : 0.582 \quad 14.78
\end{align*}
BASE SPECIFICATION — JEDEC No.14BH

Pin 1: Heater  
Cap: Anode (Grid No.3, Grid No.5, Screen, Collector)

Pin 2: Cathode of Red Gun  
Pin 3: Grid No.1 of Red Gun  
Pin 4: Grid No.2 of Red Gun  
Pin 5: Grid No.2 of Green Gun  
Pin 6: Cathode of Green Gun  
Pin 7: Grid No.1 of Green Gun  
Pin 9: Grid No.4  
Pin 11: Cathode of Blue Gun  
Pin 12: Grid No.1 of Blue Gun  
Pin 13: Grid No.2 of Blue Gun  
Pin 14: Heater

LOCATION OF RADIAL-COVERGING POLE PIECES VIEWED FROM SCREEN END OF GUNS
0.5 mR/h ISODOSE – RATE LIMIT CURVE

![Graph of ANODE VOLTAGE vs ANODE CURRENT](image1)

**Figure 1**

X-RADIATION LIMIT CURVE AT A CONSTANT ANODE CURRENT OF 300 µA (X-RADIATION AT A CONSTANT ANODE VOLTAGE VARIES LINEARLY WITH ANODE CURRENT)

![Graph of X-RADIATION vs ANODE VOLTAGE](image2)

**Figure 2**
TYPICAL DRIVE CHARACTERISTICS, GRID-DRIVE SERVICE

HEATER VOLTAGE = 6.3 V
ANODE - TO - CATHODE VOLTAGE = 17 TO 22.5 kV
GRID No. 4 - TO - CATHODE VOLTAGE ADJUSTED FOR FOCUS.
GRID No. 2 - TO - CATHODE VOLTAGE (EACH GUN) ADJUSTED TO PROVIDE SPOT CUTOFF.
• = ZERO - BIAS POINT

ANODE CURRENT PER GUN - µA V

VIDEO SIGNAL VOLTAGE PER GUN - V

92LM-3541
TYPICAL DRIVE CHARACTERISTICS, CATHODE-DRIVE SERVICE

HEATER VOLTAGE = 6.3 V
ANODE-TO-GRID-No. 1 VOLTAGE = 17 TO 22.5 kV
GRID-No.4-TO-GRID-No.1 VOLTAGE
ADJUSTED FOR FOCUS.
GRID-No.2-TO-GRID-No.1 VOLTAGE (EACH GUN) ADJUSTED TO
PROVIDE SPOT CUTOFF.

- ZERO - BIAS POINT

ANODE CURRENT PER GUN - µA

VIDEO SIGNAL VOLTAGE PER GUN - V
CUTOFF DESIGN CHART

HEATER VOLTAGE = 6.3 V
ANODE -TO- CATHODE VOLTAGE = 17 TO 22.5 kV
GRID - No. 4 - TO- CATHODE VOLTAGE ADJUSTED FOR FOCUS.

Figure 3

RCA Electronic Components
DATA 6