



ELECTRONIC TUBE REFERENCE

11HP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Eleven-inch P4 cathode-ray picture tube intended for high-voltage direct-view display. RMA/EIA data specify typical anode operation around 11 kV, adjustable grid-four focusing, and the usual control and heater limits of a television CRT.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / 450 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	5 V
<i>CRT anode/ultor voltage is represented in MaxPlateVoltage; additional electrode, drive, optical, and capacitance data retained as parameters.</i>	

11HP4 Cathode Ray Tube

The **11HP4** is an 11-inch rectangular glass cathode ray tube (CRT) designed primarily for television receiver applications. It features electrostatic focusing, magnetic deflection with a nominal diagonal deflection angle of 110 degrees, and a lightweight glass envelope. The tube incorporates tension-banded implosion protection, a short overall length, a small neck diameter, and an electron gun designed without an ion trap. This gun is optimized for operation at an intermediate Grid No. 2 voltage, making it particularly suited for cathode-drive circuits.

Mechanical Design and Physical Dimensions

The 11HP4 is constructed with a rectangular glass bulb, a spherical gray faceplate, and an aluminized fluorescent screen. The aluminized backing increases light output and prevents undesirable screen charging during operation. Additionally, the tube features an external conductive coating that, when grounded, acts as a filter capacitor in conjunction with the internal conductive coating.

Physical Dimensions

The physical envelope is designed to minimize space requirements while maintaining a useful screen area:

- **Overall Length:** 8 15/16 +/- 1/4 inches
- **Greatest Bulb Dimensions:**
 - **Diagonal:** 10.950 +/- 0.125 inches
 - **Width:** 9.825 +/- 0.125 inches
 - **Height:** 7.985 +/- 0.100 inches
- **Minimum Useful Screen Dimensions (Projected):**
 - **Diagonal:** 10 1/4 inches
 - **Horizontal Axis:** 9 inches
 - **Vertical Axis:** 7 1/16 inches
 - **Area:** 60 square inches
- **Neck Length:** 4 1/4 +/- 1/8 inches

Mounting and Alignment

The tube utilizes a JEDEC No. J1-21 bulb contact for the high-voltage anode terminal and a JEDEC No. B7-208 base. The basing configuration is designated as **8HR**.

Proper installation requires attention to the following mechanical specifications:

- **Bulb Contact Alignment:** The anode contact aligns with base pin number 4 within a tolerance of +/- 30 degrees.
- **Socket Requirements:** A non-rigidly mounted socket with flexible leads must be used. The bottom circumference of the base wafer is designed to fall within a 1 3/4-inch diameter circle concentric with the bulb axis.
- **Reference Line:** The reference line of the tube is determined by the intersection of the plane C-C of an EIA No. 126 gage with the glass funnel.

Electrical Characteristics and Basing

The 11HP4 is designed with a low-power heater and specific interelectrode capacitances to facilitate high-frequency video response in cathode-drive configurations.

Heater Ratings

The heater is designed for operation from a nominal 6.3-volt supply:

- **Heater Voltage:** 6.3 V (nominal)
- **Heater Current:** 450 +/- 23 mA
- **Heater Warm-up Time:** 11 seconds

Direct Interelectrode Capacitances

The direct capacitances between the electrodes are kept low to minimize loading on the driving circuitry:

- **Cathode to all other electrodes:** approximately 5 pF
- **Grid No. 1 to all other electrodes:** approximately 6 pF
- **External conductive coating to anode:** 500 pF minimum to 750 pF maximum

Basing Diagram (8HR)

The 8HR base connection scheme, viewed from the bottom of the tube, is configured as follows:

- **Pin 1:** Heater (H)
- **Pin 2:** Grid No. 1 (G1)
- **Pin 3:** Grid No. 2 (G2)
- **Pin 4:** Grid No. 4 / Focusing Electrode (F)
- **Pin 6:** Grid No. 1 (G1)
- **Pin 7:** Cathode (K)
- **Pin 8:** Heater (H)
- **Bulb Contact:** Anode (A)

Ratings and Operating Conditions

The electrical ratings of the 11HP4 are defined under the Design Maximum System. Unless otherwise specified, all voltage values are positive and measured with respect to Grid No. 1.

Design Maximum Ratings

Operating the tube outside these limits may impair performance or cause permanent damage:

- **Anode Voltage:** 15,000 volts maximum, 9,000 volts minimum
- **Grid No. 4 (Focusing Electrode) Voltage:** -500 to +1000 volts maximum
- **Grid No. 2 Voltage:** 250 volts maximum, 100 volts minimum
- **Cathode Voltage:**
 - **Maximum Positive DC Value:** 140 volts
 - **Maximum Positive Peak Value:** 200 volts
 - **Maximum Negative DC Value:** 0 volts
 - **Maximum Negative Peak Value:** 2 volts

- **Heater Voltage Limits:** 5.7 volts minimum to 6.9 volts maximum
- **Maximum Heater-Cathode Voltage:**
 - **Heater negative with respect to cathode:**
 - During warm-up period (not to exceed 15 seconds): 410 volts
 - After equipment warm-up period: 200 volts
 - **Heater positive with respect to cathode:** 200 volts

Typical Operating Conditions (Cathode-Drive Service)

In typical cathode-drive applications, the electrodes are biased at the following potentials:

- **Anode Voltage:** 11,000 volts DC
- **Grid No. 4 Voltage (Focusing Electrode):** 0 volts DC
- **Grid No. 2 Voltage:** 150 volts DC
- **Cathode-to-Grid No. 1 Voltage for Cut-off:** 31 to 49 volts (defined at the point of visual extinction of the focused raster)

The typical focusing electrode voltage of 0 volts DC is specified under the condition where the combined Grid No. 1 bias voltage and video-signal voltage are adjusted to yield an anode current of 150 microamperes. This is measured on a 9 x 7 1/16 inch pattern using an RCA [2F21](#) monoscope or equivalent.

Circuit Design and Protection

To ensure reliable operation and prevent damage to the internal gun structure from momentary high-voltage arcs, specific circuit resistance limits and protective measures must be implemented.

Maximum Circuit Resistance Values

- **Maximum Grid No. 1 Circuit Resistance:** 1.5 megohms
- **Minimum Grid No. 2 Circuit Resistance:** 0.1 megohm
- **Minimum Focusing Electrode Circuit Resistance:** 0.1 megohm

Protective Recommendations

It is highly advisable to include protective series resistance in both the Grid No. 2 and the focusing electrode electrical circuits. These resistors limit transient currents in the event of internal tube arcing. If appropriate for the circuit topology, a single common resistor may be shared between both the Grid No. 2 and focusing electrode circuits, provided it meets the minimum resistance requirements.

Optical and Deflection Characteristics

The optical and scanning characteristics of the 11HP4 are optimized for monochrome television display:

- **Phosphor:** P4 Aluminized, which provides a white fluorescence with medium persistence.
- **Light Transmittance:** Approximately 52% at the center of the spherical gray faceplate.

- **Deflection Angles (Approximate):**

- **Diagonal:** 110 degrees
- **Horizontal:** 99 degrees
- **Vertical:** 82 degrees

These wide deflection angles permit a compact cabinet design by reducing the required depth of the television chassis.

Technical Summary

The **11HP4** is a specialized 11-inch rectangular glass cathode ray tube designed for compact monochrome television applications. Featuring a 110-degree diagonal magnetic deflection angle and electrostatic focusing, it achieves a short overall length of 8 15/16 inches and a small neck diameter. Its non-ion trap electron gun is optimized for cathode-drive service, operating at intermediate Grid No. 2 voltages (typically 150 V DC) and requiring a cathode-to-grid cut-off voltage of 31 to 49 V DC. The tube's aluminized P4 screen and spherical gray faceplate provide high light output with approximately 52% center light transmittance. With a robust design maximum rating system, including a 15,000-volt maximum anode limit and built-in tension-banded implosion protection, the 11HP4 represents a highly integrated and reliable display solution.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1964 RMA EIA

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1964 RMA EIA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum anode voltage	9000 V	—
Maximum anode voltage	5 V	—
Minimum anode voltage	9000 V	—
Typical anode voltage	11000 V	—
Maximum grid No. 2 voltage	250 V	—
Minimum grid No. 2 voltage	100 V	—
Typical grid No. 2 voltage	150 V	—
Maximum heater voltage	6.9 V	—
Minimum heater voltage	3.7 V	—
Grid No. 4 focusing voltage range	-500–1000 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No. 1 to other electrodes capacitance	6 pF	—
Cathode to other electrodes capacitance	5 pF	—