



ELECTRONIC TUBE REFERENCE

16BFP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

CATHODERAY

Sixteen-inch P4 cathode-ray picture tube documented by RMA/EIA for high-voltage direct-view display. Typical anode operation is approximately 12 kV, consistent with monochrome television picture-tube service.

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

No fixed ratings recorded.

CRT anode/ultor voltage is represented in MaxPlateVoltage; additional electrode, drive, optical, and capacitance data retained as parameters.

16BFP4 — Rectangular Glass Picture Tube

The **16BFP4** is a 16-inch rectangular glass picture tube designed for television receiver applications. It features low-voltage electrostatic focusing and a 114-degree magnetic deflection system. Utilizing a short-neck design and an electron gun that requires no ion-trap magnet, the tube is engineered to provide sharp focus across the entire screen area. The physical placement of its anode cap is optimized to facilitate compact television cabinet designs. Additionally, the 16BFP4 incorporates a 6.3-volt, 450-milliampere heater with a controlled warm-up time, making it highly suitable for series heater-string configurations.

Mechanical Specifications and Physical Dimensions

The 16BFP4 is constructed with a rectangular glass envelope and has the following physical dimensions:

- **Overall Length:** 10 1/16 $\pm$ 3/8 inches
- **Greatest Width:** 13 45/64 $\pm$ 1/8 inches
- **Greatest Height:** 11 3/32 $\pm$ 1/8 inches
- **Diagonal Dimension:** 15 5/8 $\pm$ 1/8 inches
- **Approximate Weight:** 9 lbs

The minimum screen dimensions are:

- **Greatest Width:** 12 3/4 inches
- **Greatest Height:** 10 1/16 inches
- **Diagonal:** 14 11/16 inches
- **Projected Area:** 119 square inches

Mounting and Alignment

The tube can be operated in any position. The electrical connection to the high-voltage anode (ultor) is made via a recessed small cavity cap (JEDEC No. J1-21). The base is a small-button neoeighter 7-pin configuration (JEDEC B7-208) with an 8HR basing designation.

To ensure proper alignment during installation, the plane passing through the tube axis and pin No. 4 may vary from the plane through the tube axis and the ultor terminal by an angular tolerance of ± 30 degrees. The ultor terminal is positioned on the same side of the envelope as pin No. 4. The reference line of the tube is determined by the intersection of plane CC' of a JEDEC G-126 reference-line gauge with the glass funnel when the tube neck is fully inserted and seated.

Electrical and Optical Characteristics

Heater Parameters

The 16BFP4 is equipped with an indirectly heated cathode. The heater is designed for either series or parallel operation:

Parameter	Value
Nominal Heater Voltage	6.3 V
Heater Current at 6.3 V	450 $\pm$ 22 mA
Heater Warm-up Time	11 seconds

The controlled 11-second warm-up time is specifically designed to ensure reliable performance and prevent voltage surges in television receivers employing series-connected heater strings.

Direct Interelectrode Capacitances

- **Grid No. 1 to all other electrodes:** 6 pF
- **Cathode to all other electrodes:** 5 pF
- **External conductive coating to ultor:** 1500 pF maximum, 800 pF minimum

Optical and Deflection Characteristics

The faceplate is made of filter glass with an approximate light transmission of 78% at the center. The screen utilizes an aluminized P4 phosphor, which exhibits white fluorescence and white phosphorescence with a medium-short persistence.

The nominal deflection angles are:

- **Diagonal:** 114°
- **Horizontal:** 102°
- **Vertical:** 85°

The internal electron gun is designed to operate without the need for an external ion-trap magnet.

Grid-Drive Service

In grid-drive service, operating voltages are specified as positive with respect to the cathode, unless otherwise noted.

Maximum and Minimum Ratings (Design-Maximum Values)

- **Ultor Voltage:** 15,400 max Volts, 9,000 min Volts
- **Grid No. 4 (Focusing) Voltage:** Positive value of 1,100 max Volts, Negative value of 500 max Volts
- **Grid No. 2 Voltage:** 550 max Volts, 200 min Volts
- **Grid No. 1 Voltage:**
 - Negative peak value: 220 max Volts
 - Negative bias value: 154 max Volts
 - Positive bias value: 0 max Volts
 - Positive peak value: 2 max Volts
- **Heater Voltage:** 6.9 max Volts, 5.7 min Volts
- **Peak Heater-Cathode Voltage:**
 - *Heater negative with respect to cathode:* 450 max Volts during the first 15 seconds of equipment warm-up; 200 max Volts after the warm-up period.
 - *Heater positive with respect to cathode:* 200 max Volts.

Equipment Design Ranges

For any ultor voltage between 9,000 and 15,400 Volts and Grid No. 2 voltage between 200 and 550 Volts, the design ranges are:

- **Grid No. 4 Voltage for Focus:** 0 to 400 Volts
- **Grid No. 4 Current:** -25 to +25 μ A
- **Grid No. 2 Current:** -15 to +15 μ A
- **Grid No. 1 Voltage for Visual Extinction of Focused Raster:** Determined by the raster-cutoff-range characteristics.
- **Field Strength of Adjustable Centering Magnet:** 0 to 8 gauss
- **Maximum Grid No. 1 Circuit Resistance:** 1.5 megohms

Typical Operating Example

Under typical grid-drive operating conditions, the design parameters are utilized as follows:

- **Ultor Voltage:** 12,000 Volts
- **Grid No. 2 Voltage:** 400 Volts
- **Grid No. 4 Voltage for Focus:** 0 to 400 Volts
- **Grid No. 1 Voltage for Visual Extinction of Focused Raster:** -36 to -94 Volts

Cathode-Drive Service

In cathode-drive service, operating voltages are specified as positive with respect to Grid No. 1, unless otherwise noted.

Maximum and Minimum Ratings (Design-Maximum Values)

- **Ultor to Grid No. 1 Voltage:** 15,400 max Volts, 9,000 min Volts
- **Grid No. 4 to Grid No. 1 (Focusing) Voltage:** Positive value of 1,250 max Volts, Negative value of 400 max Volts
- **Grid No. 2 to Grid No. 1 Voltage:** 700 max Volts, 350 min Volts
- **Grid No. 2 to Cathode Voltage:** 550 max 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, 5.7 min Volts
- **Peak Heater-Cathode Voltage:**
 - *Heater negative with respect to cathode:* 450 max Volts during the first 15 seconds of equipment warm-up; 200 max Volts after the warm-up period.
 - *Heater positive with respect to cathode:* 200 max Volts.

Equipment Design Ranges

For any ultor to Grid No. 1 voltage between 9,000 and 15,400 Volts and Grid No. 2 to Grid No. 1 voltage between 350 and 700 Volts, the design ranges are:

- **Grid No. 4 to Grid No. 1 Voltage for Focus:** 0 to 400 Volts
- **Grid No. 4 Current:** -25 to +25 μ A
- **Grid No. 2 Current:** -15 to +15 μ A
- **Cathode to Grid No. 1 Voltage for Visual Extinction of Focused Raster:** Determined by the cathode-drive raster-cutoff-range characteristics.
- **Field Strength of Adjustable Centering Magnet:** 0 to 8 gauss
- **Maximum Grid No. 1 Circuit Resistance:** 1.5 megohms

Typical Operating Example

Under typical cathode-drive operating conditions, the design parameters are utilized as follows:

- **Ultor Voltage:** 12,000 Volts
- **Grid No. 2 Voltage:** 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

Operating Considerations and Installation

Electrical and Safety Precautions

- **Grounding:** The external conductive coating of the 16BFP4 must be reliably grounded to the chassis.
- **Socket Mounting:** The socket for the small-button neoeight 7-pin base must not be rigidly mounted. It should be connected via flexible leads and allowed to move freely to prevent mechanical stress on the glass base pins.
- **Shatter-Proof Cover:** In accordance with standard television receiver safety practices, the cabinet must be equipped with a shatter-proof glass cover over the face of the tube. This cover protects the user from accidental impacts, guards against damage from potential tube implosion under abnormal conditions, and provides X-ray protection when required.
- **Voltage Limits:** To maintain adequate picture brilliance and definition, the ultor voltage (or ultor to Grid No. 1 voltage) should not be operated below 10,000 Volts.

Focus and Centering

- **Focusing Range:** Individual tubes will achieve satisfactory focus at a specific voltage between 0 and 400 Volts on Grid No. 4 (or Grid No. 4 to Grid No. 1). This focus is evaluated with the combined bias voltage and video-signal voltage adjusted to produce an ultor current of 100 microamperes.
- **Centering Magnet:** If a permanent magnet (P.M.) centering magnet is used, its distance from the reference line must not exceed 2-1/8 inches. The field strength of the adjustable centering magnet should be within the range of 0 to 8 gauss.
- **Spot Deflection:** In the absence of extraneous magnetic fields, the center of the undeflected focused spot will fall within a circle of 3/8-inch radius concentric with the center of the tube face. However, the Earth's magnetic field is strong enough to cause up to a 1/2-inch deflection of the spot from the physical center of the screen, which must be compensated for during receiver setup.

Basing and Terminal Connections

The 16BFP4 uses the **8HR** basing arrangement. The pin connections, viewed from the bottom of the base, are as follows:

Pin Number	Connection
Pin 1	Heater
Pin 2	Grid No. 1
Pin 3	Grid No. 2
Pin 4	Grid No. 4 (Focusing Electrode)
Pin 6	Grid No. 1
Pin 7	Cathode
Pin 8	Heater
Cap (P)	Ultor (Anode)
Coating (C)	External Conductive Coating

Note: Pin 5 is omitted from the small-button neoeighther 7-pin base configuration.

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
Typical anode voltage	12000 V	—

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater warm-up time	11 s	—

CAPACITANCE

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

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