



ELECTRONIC TUBE REFERENCE

16EP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Direct-view P4 television picture tube using magnetic focusing and deflection, with white medium-persistence fluorescence, approximately 60-degree deflection, and typical 12 kV anode operation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	120	BASE PINS	5
NOMINAL HEATER	6.3 V / 600 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	14000 V
MAXIMUM SCREEN VOLTAGE	410 V
<i>CRT-specific anode/focus/deflection ratings retained as parameters rather than mapped to ordinary plate/screen fields.</i>	

16EP4 — Cathode Ray Picture Tube

The **16EP4**, **16EP4A**, and **16EP4B** are direct-view cathode ray picture tubes designed for television receiver applications. These tubes feature a round metal-cone construction, a unipotential cathode, magnetic focusing and deflection, and require an external single-field ion trap magnet. They are designed to produce a standard 10-inch by 13-1/4-inch television raster.

The three variants are electrically and mechanically identical except for their faceplate treatments. The 16EP4 utilizes a standard clear faceplate, whereas the **16EP4A** and **16EP4B** incorporate a grey filter glass faceplate to improve picture contrast under ambient light. Additionally, the faceplate of the **16EP4B** is specially treated to reduce specular reflections.

Mechanical Design and Physical Dimensions

The 16EP4 family utilizes a hybrid metal-glass construction where a high-strength round metal cone connects the glass neck assembly to the faceplate. The electrical connection to the anode and Grid No. 3 is made directly via the metal cone lip.

The physical dimensions of the tube are as follows:

- **Overall Length:** $19\text{-}5/16 \pm 3/8$ inches
- **Greatest Bulb Diameter:** $15\text{-}7/8 \pm 1/8$ inches
- **Minimum Useful Screen Diameter:** $14\text{-}3/8$ inches
- **Neck Diameter:** $1\text{-}7/16 \pm 1/16$ inches
- **Deflection Angle:** Approximately 60 degrees

Specific mechanical spacing along the neck is required for proper operation of the external components. A neck length of $3\text{-}3/4$ inches must be kept clear of obstructions to accommodate the external ion trap magnet. The distance from the reference line to the center of the air gap on the focusing coil is specified as 2.75 inches. The distance from the reference line to the anode terminal (metal cone lip) is $12\text{-}7/16 \pm 5/16$ inches, and the distance from the reference line to the base end is $11\text{-}7/8 \pm 1/8$ inches.

The tube is fitted with a small shell duodecal 5-pin base (designation B5-57) and uses the [12D](#) basing arrangement.

Optical and Faceplate Characteristics

The screen of the 16EP4 utilizes Phosphor No. 4, which provides a white fluorescence and white phosphorescence with medium persistence, making it suitable for displaying moving television images without excessive trailing or flicker.

The faceplate characteristics differ among the variants to optimize performance under various viewing conditions:

- **16EP4:** Standard clear faceplate.
- **[16EP4A](#):** Grey filter faceplate providing an approximate light transmission of 66% at the center to enhance contrast.
- **[16EP4B](#):** Grey filter faceplate with approximately 66% light transmission at the center, combined with an anti-reflection surface treatment that limits the specular reflection of ambient light to approximately 2.5%.

Electrical Connections and Interelectrode Capacitances

The 16EP4 uses a duodecal base with five active pins. The electrical connections, viewed from the bottom of the base, are assigned as follows:

Pin Number	Electrode Connection
Pin 1	Heater
Pin 2	Grid No. 1 (Control Grid)
Pin 10	Grid No. 2 (Screen Grid)
Pin 11	Cathode
Pin 12	Heater
Metal Cone Lip	Anode, Grid No. 3

The direct interelectrode capacitances of the tube are relatively low, minimizing loading on the driving circuitry:

- **Cathode to all other electrodes:** Approximately 5 μF
- **Grid No. 1 to all other electrodes:** Approximately 6 μF

Ratings and Typical Operating Conditions

The operating limits of the 16EP4 are defined under the Design Center Values rating system. Operating the tube within these limits ensures reliable performance and longevity.

Maximum Ratings

- **Heater Voltage:** 6.3 V
- **Heater Current:** 0.6 A
- **Maximum DC Anode & Grid No. 3 Voltage:** 14,000 V
- **Maximum DC Grid No. 2 Voltage:** 410 V
- **Maximum Grid No. 1 Voltage:**
 - *DC Negative-bias value:* 125 V
 - *DC Positive-bias value:* 0 V
 - *Positive-peak value:* 2 V
- **Maximum DC Peak Heater-Cathode Voltage:**
 - *Heater negative with respect to cathode during warm-up (not to exceed 15 seconds):* 410 V
 - *Heater negative with respect to cathode after warm-up:* 140 V
 - *Heater positive with respect to cathode:* 140 V
- **Maximum Grid No. 1 Circuit Resistance:** 1.5 Megohms

To prevent damage and minimize hum pickup, the cathode should be returned to one side or to the mid-tap of the heater transformer winding.

Typical Operating Conditions

Under typical operating conditions, the tube is set up with the following parameters:

- **DC Anode & Grid No. 3 Voltage:** 12,000 V
- **DC Grid No. 2 Voltage:** 300 V
- **DC Grid No. 1 Voltage (for visual extinction of undeflected focused spot):** -33 V to -77 V
- **DC Focusing Coil Current:** Approximately $105 \pm 20\%$ mA (using a standard focus coil such as the #109 or equivalent)
- **DC Ion Trap Current:** Approximately $80 \pm 50\%$ mA (using standard single-field ion trap coil #111)

The typical focusing coil current is specified for a setup where the combined Grid No. 1 bias voltage and video signal voltage are adjusted to produce a highlight brightness of 30 foot-lamberts on a standard 10-inch by 13-1/4-inch picture size, with the focus coil air gap center positioned exactly 2.75 inches from the reference line.

Technical Summary

The **16EP4**, **16EP4A**, and **16EP4B** are 60-degree, magnetically focused and deflected cathode ray picture tubes featuring a round metal-cone envelope. They operate with a 6.3 V, 0.6 A heater and are designed for direct-view television applications. The variants provide options for contrast enhancement and glare reduction through the use of grey filter faceplates (**16EP4A** and **16EP4B**) and anti-reflection surface treatment (**16EP4B**). With a maximum anode rating of 14,000 V and typical operation at 12,000 V, these tubes deliver a bright, medium-persistence white display (Phosphor No. 4) across a 10-inch by 13-1/4-inch raster. Proper operation requires an external single-field ion trap magnet and a magnetic focusing coil aligned precisely along the neck.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Anode Voltage	14000 V	—
Typical Anode Voltage	12000 V	—
Maximum Grid2 Voltage	410 V	—
Typical Grid2 Voltage	300 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DeflectionAngleApproximate	60 degree	—
FocusingMethod	Magnetic	—
DeflectingMethod	Magnetic	—
PhosphorNumber	4	—
FluorescentColor	White	—
Persistence	Medium	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 4 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 4 OF 4

Section 1 · Cathode Ray

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	Magnetic	—
Deflecting method	Magnetic	—
Phosphor	P4	White;MediumPersistence

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Deflection angle	60 deg	Approximate

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode to all other electrodes capacitance	5 pF	Approximate
Grid #1 to all other electrodes capacitance	6 pF	Approximate

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	6.3 V	—
Heater current	600 mA	—
Maximum DC anode voltage	14000 V	—
Maximum DC grid #2 voltage	410 V	—
Maximum grid #1 negative-bias magnitude	125 V	—
Maximum grid #1 positive DC bias	0 V	—
Maximum grid #1 positive peak	2 V	—
Typical DC anode voltage	12000 V	TelevisionPictureTube
Typical DC grid #2 voltage	300 V	TelevisionPictureTube
Typical grid #1 voltage minimum	-77 V	VisualExtinctionRange
Typical grid #1 voltage maximum	-33 V	VisualExtinctionRange
Focusing coil current	105 mA	Approximate
Ion trap current	80 mA	Approximate

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum heater-cathode voltage during warm-up	410 V	HeaterNegative;Warmup<=15s

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Direct-view television picture tube	—