ELECTRONIC TUBE REFERENCE

16FP4

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 62-degree deflection, and typical 13 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

SECTION1 Cathode Ray

MAXIMUM PLATE VOLTAGE	16000 V
MAXIMUM SCREEN VOLTAGE	410 V

CRT-specific anode/focus/deflection ratings retained as parameters rather than mapped to ordinary plate/screen fields.

16FP4 — Cathode Ray Picture Tube

The **16FP4** is a direct-view, round glass picture tube designed primarily for television receiver applications. It features a unipotential cathode, magnetic focusing, magnetic deflection, and requires an external single-field ion trap magnet for proper operation. The tube provides a nominal raster size of 10-1/4 inches by 13-1/2 inches.

Mechanical and Physical Construction

The 16FP4 is constructed with a round glass bulb. Its physical dimensions and mechanical features are highly standardized to facilitate mounting and alignment within television chassis:

- **Overall Length:** 20-1/4 ± 3/8 inches
- **Greatest Diameter of Bulb:** 16-1/8 ± 1/4 inches
- **Minimum Useful Screen Diameter:** 15 inches
- **Minimum Useful Screen Dimensions:** 13-1/2 inches width by 10-1/4 inches height
- **Neck Diameter:** 1-7/16 ± 1/16 inches
- **Bulb Contact:** Recessed small ball cap (J1-22)
- **Base:** Small shell duodecal 5-pin base (BS-57)
- **Basing Designation:** 12D

Bulb Contact Alignment

The recessed small ball cap (J1-22) serves as the anode terminal. To ensure proper orientation, the J1-22 contact aligns with pin position #3 on the base within a tolerance of ±10 degrees. Additionally, a specific region on the neck must be kept clear for the installation of the external ion trap magnet.

Electrical Connections and Basing

The 16FP4 utilizes a duodecal base with five active pins, designated as the 12D basing configuration. The electrical connections, viewed from the bottom of the base, are assigned as follows:

Pin Number	Connection
Pin 1	Heater
Pin 2	Grid No. 1 (Control Grid)
Pin 10	Grid No. 2 (Screen Grid)
Pin 11	Cathode
Pin 12	Heater
Anode Cap	Grid No. 3 / Anode

The heater is designed to operate from either an AC or DC supply.

Optical Characteristics

The screen of the 16FP4 is coated with Phosphor No. 4, which is optimized for television display applications. Its optical properties include:

- **Fluorescent Color:** White
- **Phosphorescent Color:** White
- **Persistence:** Medium

These characteristics provide a bright, neutral white image with decay times suited for standard television frame rates without objectionable smearing or flicker.

Maximum Ratings (Design Center Values)

The operating limits of the 16FP4 are specified under the Design Center system. Operating the tube beyond these limits may impair performance or shorten its service life.

Parameter	Rating
Heater Voltage	6.3 V
Heater Current	0.6 A
Maximum DC Anode (Grid No. 3) Voltage	16,000 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, ≤ 15 seconds)	410 V
— Heater negative with respect to cathode (after warm-up period)	140 V
— Heater positive with respect to cathode	140 V

Circuit Values

To prevent instability or damage due to gas current or grid emission, the maximum grid No. 1 circuit resistance must not exceed **1.5 Megohms**.

Typical Operating Conditions and Characteristics

Under typical operating conditions, the 16FP4 is set up with specific electrode potentials and auxiliary magnetic fields to achieve optimal focus, brightness, and beam alignment.

- **DC Anode (Grid No. 3) Voltage:** 13,000 V
- **DC Grid No. 2 Voltage:** 250 V
- **DC Grid No. 1 Voltage:** -27 V to -63 V (for visual extinction of the undeflected focused spot)
- **DC Focusing Coil Current (Approximate):** 146 mA
- **DC Ion Trap Current (Approximate):** 105 mA

Focusing and Ion Trap Alignment Details

The typical focusing coil current of 146 mA is specified using a standard focus coil #106 (or equivalent). This value is obtained when the combined Grid No. 1 bias voltage and video signal voltage are adjusted to produce a highlight brightness of 35 foot-lamberts on a standard 10-1/4 inch by 13-1/2 inch picture size. For this operating point, the distance from the reference line to the center of the air gap on the focus coil must be maintained at exactly 3.0 inches.

The external single-field ion trap requires a standard coil #111 (or equivalent) operating at approximately 105 mA to properly direct the electron beam and prevent ion burn on the phosphor screen.

Interelectrode Capacitances

The direct interelectrode capacitances of the tube, measured without external shielding, are approximately:

- **Cathode to all other electrodes:** 5 pF
- **Grid No. 1 to all other electrodes:** 7 pF

These low capacitances ensure that the video drive circuitry is not excessively loaded, preserving the high-frequency response necessary for sharp image reproduction.

Technical Summary

The **16FP4** is a 16-inch round glass, direct-view cathode ray picture tube designed for television receivers. It utilizes magnetic focus and deflection with a 62-degree deflection angle, requiring an external single-field ion trap magnet. Operating with a 6.3 V, 0.6 A heater, the tube is rated for a maximum anode (Grid No. 3) voltage of 16,000 V and typical operation at 13,000 V. Its screen utilizes Phosphor No. 4 to produce a medium-persistence white display on a 10-1/4 inch by 13-1/2 inch raster. The tube is based with a small shell duodecal 5-pin base (BS-57) under the 12D basing configuration, providing a reliable and standardized platform for vintage television designs.

SOURCE OPERATING CONDITIONS

1961 Tung Sol

SOURCE PDF

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	**16000 V**	—
Typical Anode Voltage	**13000 V**	—
Maximum Grid2 Voltage	**410 V**	—
Typical Grid2 Voltage	**300 V**	—

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
DeflectionAngleApproximate	**62 degree**	—
FocusingMethod	**Magnetic**	—
DeflectingMethod	**Magnetic**	—
PhosphorNumber	**4**	—
FluorescentColor	**White**	—
Persistence	**Medium**	—

SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1966 Tung Sol Electronic Tubes 4 of 4

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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	**62 deg**	Approximate

CAPACITANCE		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Cathode to all other electrodes capacitance	**5 pF**	Approximate
Grid #1 to all other electrodes capacitance	**7 pF**	Approximate

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Heater voltage	**6.3 V**	—
Heater current	**600 mA**	—
Maximum DC anode voltage	**16000 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	**13000 V**	TelevisionPictureTube
Typical DC grid #2 voltage	**250 V**	TelevisionPictureTube
Typical grid #1 voltage minimum	**-63 V**	VisualExtinctionRange
Typical grid #1 voltage maximum	**-27 V**	VisualExtinctionRange
Focusing coil current	**146 mA**	Approximate
Ion trap current	**105 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**	—

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