

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

16UP4

Specialized - Cathode Ray electronic tube

1 SECTION
CONSTRUCTION
CATHODERAY

P4 cathode-ray display tube documented for high-voltage direct-view operation, using magnetic deflection and manufacturer-specified beam focusing and control arrangements appropriate to type 16UP4.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	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	5000 V
MAXIMUM SCREEN VOLTAGE	410 V
CRT-specific anode, focus, deflection and optical data retained as parameters rather than forced into ordinary plate/screen fields.	

16UP4 — Cathode Ray Picture Tube

A direct-view, rectangular glass cathode ray tube designed for television display applications, featuring magnetic focus and deflection, a grey filter faceplate, and an external single-field ion trap.

Overview

The **16UP4** is a specialized rectangular glass-construction cathode ray tube (CRT) designed primarily for direct-view television receiver applications. It incorporates an indirectly heated unipotential cathode, magnetic focusing, and magnetic deflection. To optimize picture contrast under ambient room lighting, the tube is equipped with a grey filter faceplate. The design produces a nominal raster size of **10 1/8**

inches by 13 1/2 inches and requires an external single-field ion trap magnet to prevent ion burn on the phosphor screen.

Mechanical Design and Physical Dimensions

The 16UP4 features a rectangular glass bulb envelope with a nominal screen diagonal of **15 inches**. The physical dimensions and tolerances of the bulb structure are tightly defined to ensure proper mounting and alignment within television cabinets:

Dimension Parameter	Nominal Value	Tolerance / Specification
Overall Length	18 1/8 inches	± 1/2 inch
Greatest Bulb Diagonal	16 1/8 inches	Maximum
Greatest Bulb Width	14 3/4 inches	Maximum
Greatest Bulb Height	11 1/2 inches	Maximum
Minimum Useful Screen Diagonal	15 inches	Minimum
Minimum Useful Screen Width	13 19/32 inches	Minimum
Minimum Useful Screen Height	10 3/16 inches	Minimum
Neck Diameter	1 7/16 inches	± 1/16 inch

The bulb's high-voltage anode connection is made via a recessed small cavity cap (designated **J1-21**). This contact is aligned with pin position #3 on the base within a tolerance of **± 10 degrees**. The neck of the tube includes a designated clear space of approximately **3 5/8 inches** from the reference line to the anode terminal, which must be kept clear to accommodate the external single-field ion trap magnet.

Electrical Connections and Basing

The 16UP4 utilizes a **small shell duodecal 5-pin base** (designated **B5-57**) with a **12D** basing configuration. The electrical connections, viewed from the bottom of the base, are assigned as follows:

Pin Number	Connection Element
Pin 1	Heater
Pin 2	Grid No. 1 (Control Grid)
Pin 10	Grid No. 2 (Screen Grid)
Pin 11	Cathode
Pin 12	Heater

Pin Number	Connection Element
Cap	Anode (High-Voltage Terminal)

The heater is designed to operate on either AC or DC power, with a nominal rating of **6.3 V** and a current draw of **0.6 A**.

Ratings and Design Center Values

The operating limits of the 16UP4 are specified under the design center system. Operating the tube beyond these limits can impair performance or cause permanent damage.

Parameter	Design Center Maximum Value
Maximum DC Anode Voltage	15,000 V
Maximum DC Grid No. 2 Voltage	410 V
Maximum Grid No. 1 DC Negative-Bias Value	125 V
Maximum Grid No. 1 DC Positive-Bias Value	0 V
Maximum Grid No. 1 Positive-Peak Value	2 V
Maximum Grid No. 1 Circuit Resistance	1.5 MΩ

Heater-Cathode Voltage Limits

Because the heater and cathode are electrically insulated but physically close, specific peak voltage limits must be maintained to prevent insulation breakdown:

- **Heater negative with respect to cathode:**
 - During the initial warm-up period (not to exceed 15 seconds): **410 V** maximum.
 - After the equipment warm-up period: **125 V** maximum.
- **Heater positive with respect to cathode:** **125 V** maximum.

Typical Operating Conditions and Characteristics

Under typical operating conditions, the 16UP4 is configured with the following electrical parameters to achieve standard focus and brightness:

- **DC Anode Voltage:** 12,000 V
- **DC Grid No. 2 Voltage:** 300 V
- **DC Grid No. 1 Voltage:** –27 V to –63 V (This range represents the bias required for visual extinction of the undeflected focused spot.)
- **DC Focusing Coil Current:** Approximately 100 mA. This value is specified for a standard focus coil (such as No. 109 or equivalent), with the combined Grid No. 1 bias voltage and video signal voltage

adjusted to produce a highlight brightness of **20 foot-lamberts** on a 10 1/8-inch by 13 1/2-inch picture. The focus coil must be positioned such that the distance from the reference line to the center of the coil's air gap is exactly **3 inches**.

- **Ion Trap Magnet Strength:** 23 Gausses (rated strength of the external single-field magnet).

Optical and Deflection Characteristics

The 16UP4 is designed for magnetic deflection and magnetic focusing, utilizing wide-angle scanning to minimize the overall length of the cabinet. The approximate deflection angles are:

- **Horizontal Deflection Angle:** 65 degrees
- **Vertical Deflection Angle:** 50 degrees
- **Diagonal Deflection Angle:** 70 degrees

The screen utilizes **Phosphor No. 4**, which exhibits the following optical properties:

- **Fluorescent Color:** White
- **Phosphorescent Color:** White
- **Persistence:** Medium
- **Faceplate Light Transmission:** Approximately 70% at the center of the faceplate, achieved via the integrated grey filter glass to enhance contrast under ambient light.

Technical Summary

The **16UP4** is a **15-inch rectangular glass cathode ray tube** designed for direct-view television receivers. It features a **6.3 V, 0.6 A** heater, a **small shell duodecal 5-pin base**, and a **J1-21** recessed anode cap. Operating with a typical anode voltage of **12,000 V** (up to a maximum of **15,000 V**), it utilizes magnetic focusing and magnetic deflection with a diagonal deflection angle of **70 degrees**. The tube incorporates a **No. 4 white phosphor** screen with medium persistence and a **70% transmission grey filter faceplate** to deliver high-contrast images. Proper operation requires an external single-field ion trap magnet rated at **23 Gausses** and a standard focusing coil positioned 3 inches from the reference line.



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	15000 V	—
Typical Anode Voltage	12000 V	—
Maximum Grid2 Voltage	410 V	—
Typical Grid2 Voltage	300 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
FocusingMethod	Magnetic	—
DeflectingMethod	Magnetic	—
DiagonalDeflectionAngleApproximate	70 degree	—
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

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAGNETIC FOCUS 6 DEFLECTION – value 1	8 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAGNETIC FOCUS 6 DEFLECTION – value 2	13 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAGNETIC FOCUS 6 DEFLECTION – value 3	1 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC ANODE	1 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID	3 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
SIGNAL VOLTAGE ADJUSTED TO PRODUCE A. XI GMLIGHT BRIGHTNESS OF Z0 FOOT LAMBER TS ON A 10 1/B" BY – value 1	10 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
SIGNAL VOLTAGE ADJUSTED TO PRODUCE A. XI GMLIGHT BRIGHTNESS OF Z0 FOOT LAMBER TS ON A 10 1/B" BY – value 2	1 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
1/2" PICTURE SIZE. 01 STANCE FROM REFERENCE LINE TO CENTER OF AIR GAP ON FOCUS COIL SMALL BE – value 1	2 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
1/2" PICTURE SIZE. 01 STANCE FROM REFERENCE LINE TO CENTER OF AIR GAP ON FOCUS COIL SMALL BE – value 2	1 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
1/2" PICTURE SIZE. 01 STANCE FROM REFERENCE LINE TO CENTER OF AIR GAP ON FOCUS COIL SMALL BE – value 3	6 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM DC ANODE VOLTAGE	5000 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM OC GRID #'2 VOLTAGE – value 1	2 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM OC GRID #'2 VOLTAGE – value 2	410 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM GRID #1 CIRCUIT RESISTANCE – value 1	1 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM GRID #1 CIRCUIT RESISTANCE – value 2	1.5 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.