



ELECTRONIC TUBE REFERENCE

16HP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

CATHODERAY

P4 television picture tube using magnetic focusing and magnetic deflection, approximately 60-degree scanning, and an external double-field ion trap for beam correction.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12N	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 SCREEN VOLTAGE	4 V
<i>CRT-specific anode/focus/deflection ratings retained as parameters rather than mapped to ordinary plate/screen fields.</i>	

16HP4 — Cathode Ray Picture Tube

The **16HP4** and **16HP4A** are direct-view cathode ray picture tubes designed for television receiver applications. These tubes feature a round glass construction, magnetic focus and deflection, and require an external double field ion trap. The two designations are identical in their electrical and mechanical specifications, with the sole exception of the faceplate: the **16HP4A** incorporates a grey filter faceplate to improve contrast under ambient light, whereas the standard **16HP4** does not.

Design, Construction, and Optical Characteristics

The 16HP4 and **16HP4A** are built with a round glass envelope and feature a unipotential cathode. The tubes are designed with an external conductive coating that, in combination with the internal anode,

forms a capacitor. This capacitance helps in filtering the high-voltage anode supply.

Optical Specifications

The screen utilizes Phosphor No. 4, which provides a white fluorescent and phosphorescent color with medium persistence. This phosphor is optimized for black-and-white television reproduction. The faceplate has an approximate light transmission of 70 percent at the center. The standard raster size produced on the screen is 10 1/4 inches by 14 1/2 inches.

Deflection and Focusing

Both focusing and deflection are accomplished magnetically. The nominal deflection angle of the tube is approximately 60 degrees. To prevent screen damage from heavy ions, the electron gun design requires an external double field ion trap magnet.

Mechanical Specifications and Basing

The physical dimensions and mechanical layout of the 16HP4 and [16HP4A](#) are highly standardized to fit television chassis of their era.

Physical Dimensions

- **Overall Length:** 21 1/4 ± 3/8 inches
- **Greatest Diameter of Bulb:** 15 7/8 ± 1/8 inches
- **Minimum Useful Screen Diameter:** 14 1/2 inches
- **Neck Diameter:** 1 7/16 ± 1/16 inches
- **Distance from Reference Line to Anode Terminal:** 4 ± 3/8 inches
- **Distance from Reference Line to Top of Bulb:** 12 7/8 ± 3/16 inches
- **Distance from Reference Line to Base (Neck Length):** 4 5/8 ± 1/16 inches. This space must be kept clear for the installation of the ion trap magnet.
- **Faceplate Edge Height:** 2 1/2 ± 1/4 inches

Base and Pin Connections

The tube uses a **Small Shell Duodecal 5-Pin** base (designation B5-57) with a **12N** basing arrangement. The high-voltage anode connection is made via a recessed small cavity cap (designation J1-21) located on the side of the bulb. The J1-21 contact aligns with pin position #3 within a tolerance of ± 10 degrees.

The pin connections, viewed from the bottom of the base, are as follows:

Pin Number	Connection
Pin 1	Heater
Pin 2	Grid No. 1 (Control Grid)
Pin 10	Grid No. 2 (Screen Grid)

Pin Number	Connection
Pin 11	Cathode
Pin 12	Heater
Cap	Anode

Electrical Ratings and Operating Conditions

The operating limits and typical characteristics of the 16HP4 and 16HP4A are defined under the design center rating system.

Electrical Ratings (Design Center Values)

These ratings represent the maximum safe operating limits for the tube:

- **Heater Voltage:** 6.3 Volts
- **Heater Current:** 0.6 Ampere
- **Maximum DC Anode Voltage:** 14,000 Volts
- **Maximum DC Grid No. 2 Voltage:** 410 Volts
- **Maximum Grid No. 1 Voltage:**
 - **DC Negative-Bias Value:** 125 Volts
 - **DC Positive-Bias Value:** 0 Volts
 - **Positive-Peak Value:** 2 Volts
- **Maximum DC Peak Heater-Cathode Voltage:**
 - **Heater Negative with Respect to Cathode (During Warm-up, ≤ 15 seconds):** 410 Volts
 - **Heater Negative with Respect to Cathode (After Warm-up):** 125 Volts
 - **Heater Positive with Respect to Cathode:** 125 Volts

Typical Operating Conditions

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

- **DC Anode Voltage:** 12,000 Volts
- **DC Grid No. 2 Voltage:** 300 Volts
- **DC Grid No. 1 Voltage (for visual extinction of undeflected focused spot):** -33 to -77 Volts
- **DC Focusing Coil Current (Approximate):** 110 mA
- **DC Ion Trap Current (Approximate, using Standard Coil #108):** 120 mA

The focusing coil current of 110 mA is specified for a standard focus coil #109 (or equivalent) under the condition that the combined Grid No. 1 bias voltage and video signal voltage are adjusted to produce a highlight brightness of 20 foot-lamberts on a 10 1/4" by 14 1/2" picture size. For this setup, the distance from the reference line to the center of the air gap on the focus coil must be exactly 3.25 inches.

Circuit Values

- **Maximum Grid No. 1 Circuit Resistance:** 1.5 Megohms

Interelectrode Capacitances

The direct interelectrode capacitances of the tube are influenced by the external conductive coating:

- **Maximum External Conductive Coating to Anode:** 3,500 μpf (pF)
- **Minimum External Conductive Coating to Anode:** 1,500 μpf (pF)

Technical Summary

The **16HP4** and **16HP4A** are 16-inch round glass, magnetically focused and deflected television picture tubes. Operating with a standard 6.3 V, 0.6 A heater, they are capable of displaying a 10 1/4" by 14 1/2" raster using a white-emitting Phosphor No. 4 screen. They require an external double field ion trap and a standard focusing coil to achieve a sharp, focused spot. With a maximum design-center anode rating of 14,000 Volts and typical operation at 12,000 Volts, these tubes represent a classic example of early-1950s television display technology, distinguished primarily by the grey filter faceplate option on the **16HP4A** variant to enhance viewing contrast.



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

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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

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CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
NAGMETIC FOCUS 6 DEFLECTION	6	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
EXTERNAL DOUBLE FIELD ION TRAP – value 1	1	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
EXTERNAL DOUBLE FIELD ION TRAP – value 2	1	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
EXTERNAL DOUBLE FIELD ION TRAP – value 3	2	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DEFLECTION ANGLE (APPROX.)	60 degrees	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID #2 VOLTAGE – value 1	2 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID #2 VOLTAGE – value 2	3 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID #1 VOLTAGE A – value 1	1 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID #1 VOLTAGE A – value 2	33 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC GRID #1 VOLTAGE A – value 3	-77 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DC ION TRAP CURRENT STANDARD COIL #108 (APPROX.)	108 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
SIGNAL VOLTAGE ADJUSTED TO PRODUCE A XI GXLIGT BRIGHTNESS OF 20 FOOT LAMBERTS ON a 10 1/4" BY – value 1	10 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
SIGNAL VOLTAGE ADJUSTED TO PRODUCE A XI GXLIGT BRIGHTNESS OF 20 F00T LAMBERTS ON a 10 1/4" BY – value 2	1 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 GXLIGT BRIGHTNESS OF 20 F00T LAMBERTS ON a 10 1/4" BY – value 3	4 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
14 1/2" PICTURE SIZE. GIST ANGLE FROM REFERENCE LINE TO CENTER OF aIR GaP ON FOCUS COIL SH aLI BE – value 1	14	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
14 1/2" PICTURE SIZE. GIST ANGLE FROM REFERENCE LINE TO CENTER OF aIR GaP ON FOCUS COIL SH aLI BE – value 2	1	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
14 1/2" PICTURE SIZE. GIST ANGLE FROM REFERENCE LINE TO CENTER OF aIR GaP ON FOCUS COIL SH aLI BE – value 3	2	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
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	4 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM GRID #1 CIRCUIT RESISTANCE	1 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.

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