



ELECTRONIC TUBE REFERENCE

16SP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Round-glass P4 television picture tube using magnetic focusing and deflection, with white medium-persistence fluorescence, approximately 70-degree deflection, and typical 12 kV anode operation.

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 PLATE VOLTAGE	14000 V
<i>CRT-specific anode/focus/deflection ratings retained as parameters rather than mapped to ordinary plate/screen fields.</i>	

16SP4 — Cathode Ray Picture Tube

The **16SP4** and **16SP4A** are direct-view cathode ray picture tubes designed primarily for television receiver applications. These tubes feature a round glass construction, magnetic focus, and magnetic deflection. The 16SP4 and **16SP4A** are electrically and mechanically identical, with the sole distinction being that the **16SP4A** incorporates a grey filter faceplate to improve contrast under ambient light conditions, whereas the 16SP4 utilizes a standard clear faceplate.

Key design features of these tubes include an indirectly heated unipotential cathode, an external conductive bulb coating, and a requirement for an external single-field ion trap magnet to prevent ion burn on the phosphor screen. The tubes provide a nominal rectangular raster size of 10-1/4 inches by 14-1/2 inches.

Mechanical Specifications and Physical Dimensions

The 16SP4 and 16SP4A are constructed with a round glass envelope. The physical dimensions and mechanical features are highly standardized to ensure proper mounting and alignment within television cabinets:

Parameter	Specification	Tolerance
Overall Length	17-5/16 inches	$\pm 3/8$ inch
Greatest Diameter of Bulb	15-7/8 inches	$\pm 1/8$ inch
Minimum Useful Screen Diameter	14-1/2 inches	—
Neck Diameter	1-7/16 inches	$\pm 1/16$ inch
Neck Length (Clear Space for Ion Trap)	3-5/8 inches	$\pm 1/16$ inch
Bulb Contact	Recessed Small Cavity Cap (J1-21)	—
Base	Small Shell Duodecal 5-Pin (B5-57)	—
Basing Designation	12N	—

Bulb Contact Alignment

The high-voltage anode connection is made via a recessed small cavity cap (J1-21) located on the funnel of the bulb. To facilitate proper orientation of the socket and high-voltage lead, the J1-21 contact is aligned with pin position #3 on the base within an angular tolerance of ± 10 degrees.

Electrical Connections and Basing

The 16SP4 and 16SP4A utilize a small shell duodecal 5-pin base (B5-57) with a 12N basing configuration. The electrical connections, viewed from the bottom of the tube base, are assigned as follows:

- **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:** Anode (recessed small cavity cap J1-21)

The heater is designed to be operated from either an AC or DC supply. The unipotential cathode is electrically isolated from the heater, allowing for independent biasing within specified limits.

Optical and Deflection Characteristics

The optical and deflection systems of the 16SP4 and [16SP4A](#) are designed to produce a bright, well-focused monochrome image:

- **Phosphor:** No. 4 (P4)
- **Fluorescent Color:** White
- **Phosphorescent Color:** White
- **Persistence:** Medium
- **Deflection Method:** Magnetic
- **Focusing Method:** Magnetic
- **Deflection Angle (Approximate):** 70 degrees

The external conductive coating on the glass funnel serves as an electrical shield and, when grounded, forms a capacitor in conjunction with the internal conductive anode coating. This capacitance helps filter the high-voltage anode power supply. The direct interelectrode capacitance from the external conductive coating to the anode is rated as:

- **Maximum Capacitance:** 3,500 μF (pF)
- **Minimum Capacitance:** 1,500 μF (pF)

Electrical Ratings and Operating Conditions

The ratings for the 16SP4 and [16SP4A](#) are established under the Design Center system. Operating the tubes beyond these limits may impair performance or cause permanent damage.

Maximum Ratings (Design Center Values)

Parameter	Value	Unit
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)	125	Volts
Maximum Grid No. 1 Voltage (DC Positive-Bias)	0	Volts
Maximum Grid No. 1 Voltage (Positive-Peak)	2	Volts

Parameter	Value	Unit
Maximum Grid No. 1 Circuit Resistance	1.5	Megohms

Heater-Cathode Voltage Limits

To prevent insulation breakdown between the heater and the cathode, the peak voltage difference must be kept within the following limits:

- **Heater Negative with Respect to Cathode:**
 - During the equipment warm-up period (not to exceed 15 seconds): **410 Volts** maximum
 - After the equipment warm-up period: **125 Volts** maximum
- **Heater Positive with Respect to Cathode: 125 Volts** maximum

Typical Operating Conditions and Characteristics

Under typical operating conditions, the tube is set up with the following parameters to achieve standard focus and brightness:

- **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):** 120 mA

Focus and Ion Trap Alignment

Standard focus is achieved when the combined Grid No. 1 bias voltage and video signal voltage are adjusted to produce a highlight brightness of 20 foot-lamberts on a standard 10-1/4 inch by 14-1/2 inch picture raster. Under these conditions, the focusing coil must be positioned such that the distance from the reference line to the center of the air gap on the focus coil is exactly 3.25 inches.

Additionally, an external single-field ion trap magnet must be properly positioned over the neck of the tube (within the designated 3-5/8 inch clear space) and adjusted to obtain maximum screen brightness and prevent neck shadow. The typical ion trap coil current required is approximately 120 mA.



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	70 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
ROUND GLASS CONSTRUCTION	8 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
DEFLECTION	7 degrees	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
HEATER	6.3 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
B FOR STANDARD FOCUS WITH THE COMBINED GRID /1 BIAS VOLTAGE AND VIDEO SIGNAL VOLTAGE ADJUSTED	1 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM	14000 V	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM GRID 81 CIRCUIT RESISTANCE – value 1	81 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.
MAXIMUM GRID 81 CIRCUIT RESISTANCE – value 2	1.5 mA	Published CRT datasheet value; multiple values on a row represent the source table's separate conditions/limits.