

ELECTRONIC TUBE REFERENCE

14SP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Aluminized P4 cathode-ray display tube using electrostatic focusing and wide-angle magnetic deflection, with white short-to-medium persistence, an external ion trap, and typical 12 kV anode operation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
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	15400 V
Published maximum ratings and characteristics promoted semantically from the approved source.	

14SP4 — Electrostatic-Focus Television Picture Tube

The **14SP4** is a 14-inch, direct-viewed, rectangular glass television picture tube designed for monochrome television receivers. It features a spherical faceplate made of gray filter glass, magnetic deflection, electrostatic focusing, an aluminized screen, and an external conductive coating. The tube utilizes a single-field ion trap and is designed to operate with a standard 6.3 V heater supply.

Mechanical Design and Physical Dimensions

The 14SP4 is constructed with a rectangular glass envelope and a spherical faceplate. The faceplate is made of gray filter glass with an approximate light transmittance of 75 percent, which improves picture

contrast under ambient light conditions. The screen is aluminized and utilizes a P4 phosphor, which provides white fluorescence with a short-to-medium persistence.

Screen and Bulb Dimensions

The physical dimensions of the tube's screen and envelope are specified to ensure proper mounting and optical alignment:

- **Minimum Useful Screen Dimensions (Maximum Assured):** 12 x 9 3/8 inches
- **Minimum Useful Screen Area:** 103 square inches
- **Deflection Angles (Approximate):** 79 degrees horizontal, 85 degrees diagonal
- **Bulb Contact:** Recessed small cavity cap (designated J1-21)
- **Base:** Small shell duodecal 6-pin base (designated B6-63)
- **Basing Configuration:** 12L

Physical Alignment and Grounding

The physical layout of the tube requires specific alignment and electrical grounding during installation:

- **Reference Line:** The reference line is determined by the plane C-C' of the reference line gauge (JETEC No. 116) when the gauge is resting on the glass cone.
- **Anode Contact Alignment:** Base pin No. 6 aligns with the anode contact terminal J1-21 within a tolerance of 30 degrees.
- **External Conductive Coating:** The external conductive coating must be grounded. The contact area for this coating is a 2" x 2" region located 90 degrees counterclockwise from the anode contact, as viewed from the base end of the tube.

Electrical Characteristics and Heater Specifications

The 14SP4 is designed with an indirectly heated cathode and specific interelectrode capacitances to ensure stable operation within television receiver circuits.

Heater Parameters

The heater is designed for parallel or series operation, with a controlled warm-up characteristic:

- **Heater Voltage:** 6.3 Volts
- **Heater Current:** $0.6 \pm 5\%$ Ampere
- **Heater Warm-up Time:** 11 Seconds

The heater warm-up time is defined as the time required for the voltage across the heater terminals to increase to 5.0 volts in the JETEC test circuit, using a supply voltage (E) of 25 volts and a series resistance (R) of 31.5 ohms.

Direct Interelectrode Capacitances

The approximate direct interelectrode capacitances of the tube are:

- **Cathode to All Other Electrodes:** 5 μf (pF)
- **Grid No. 1 to All Other Electrodes:** 6 μf (pF)
- **External Conductive Coating to Anode:** 1200 μf (pF) maximum, 900 μf (pF) minimum

Operating Conditions and Focus/Deflection

The 14SP4 utilizes magnetic deflection combined with electrostatic focusing. The focusing electrode (Grid No. 4) operates at a relatively low voltage compared to the anode, allowing for flexible focus adjustment.

Typical Operating Points

Under typical operating conditions, the tube is configured with the following electrical parameters:

- **Anode Voltage:** 12,000 Volts dc
- **Grid No. 4 Voltage (Focusing Electrode):** -48 to +264 Volts dc
- **Grid No. 2 Voltage:** 300 Volts dc
- **Grid No. 1 Voltage Required for Cutoff:** -28 to -72 Volts dc

The specified Grid No. 1 cutoff voltage is based on the visual extinction of a focused raster. For the visual extinction of a stationary focused spot, the required Grid No. 1 voltage must be approximately 5 volts more negative than the raster cutoff values.

Ion Trap Magnet Requirements

To prevent ion burn on the phosphor screen, an external, single-field ion trap magnet must be used. The operating requirements depend on the type of magnet selected:

- **Electromagnetic Ion Trap:** For a JETEC Ion Trap Magnet No. 117, with pole pieces centered over Grid No. 2 on the mount and rotated for maximum brightness, the average required current is 26 mA dc.
- **Permanent Magnet (PM) Ion Trap:** For a typical PM ion trap magnet with a field strength tolerance of ± 3 gauss, the minimum required field strength is 28 gauss.

Absolute Maximum Ratings and Circuit Values

The ratings of the 14SP4 are specified under the Absolute Maximum system. Operating the tube beyond these limits may cause permanent damage or degrade performance.

Maximum Ratings

- **Anode Voltage:** 15,400 Volts dc
- **Grid No. 4 Voltage (Focusing Electrode):** -550 to +1100 Volts dc
- **Grid No. 2 Voltage:** 550 Volts dc
- **Grid No. 1 Voltage:**
 - **Negative Bias Value:** 154 Volts dc
 - **Negative Peak Value:** 220 Volts

- **Positive Bias Value:** 0 Volts dc
- **Positive Peak Value:** 2 Volts
- **Peak Heater-Cathode Voltage:**
 - **Heater Negative with Respect to Cathode (During Warm-up, ≤ 15 seconds):** 450 Volts
 - **Heater Negative with Respect to Cathode (After Warm-up):** 200 Volts
 - **Heater Positive with Respect to Cathode:** 200 Volts

Circuit Values

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

X-Ray Radiation Warning

When operating the 14SP4, safety precautions regarding X-ray emission must be observed. X-ray radiation shielding may be necessary to protect against the danger of personal injury from prolonged exposure at close range if the tube is operated at voltages higher than the manufacturer's Maximum Rated Anode Voltage (15,400 Volts dc) or 16,000 volts, whichever is less.

Technical Summary

The **14SP4** is a 14-inch rectangular glass television picture tube featuring electrostatic focusing and magnetic deflection. It is equipped with an aluminized P4 white-phosphor screen, a gray filter glass faceplate with 75% light transmittance, and an external conductive coating that must be grounded. Operating with a 6.3 V, 0.6 A heater, the tube typically runs at an anode voltage of 12,000 V dc, with a focusing electrode voltage range of -48 to +264 V dc and a Grid No. 2 voltage of 300 V dc. It requires an external single-field ion trap magnet (either electromagnetic or permanent magnet) to prevent screen damage. Designers must adhere to the absolute maximum anode voltage limit of 15,400 V dc and ensure proper X-ray shielding if operating near or above this limit.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Plate Voltage	15400 V	—
Typical Anode Voltage	12000 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor	P4	—
Focusing Method	Electrostatic	—
Deflecting Method	Magnetic	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	6.3 V	—
Heater Current	600 mA	—
Focusing Method	Electrostatic text	—
Deflection Method	Magnetic text	—
Fluorescence	White text	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Persistence	Short to Medium text	—
Phosphor	Aluminized P4 text	—
Horizontal Deflection Angle	79 deg	Approximate
Diagonal Deflection Angle	90 deg	Approximate
Light Transmittance	75 percent	Approximate
Ion Trap	External Single Field text	—
Cathode-to-All Capacitance	5 pF	Approximate
Grid1-to-All Capacitance	6 pF	Approximate
External Coating-to-Anode Capacitance Minimum	900 pF	—
External Coating-to-Anode Capacitance Maximum	1200 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode Voltage	12000 V	—
Grid2 Voltage	300 V	—
Ion Trap Magnet Current	26 mA	Representative
Minimum Ion Trap Field Strength	28 gauss	—
Maximum Anode Voltage	15400 V	—
Maximum Grid2 Voltage	550 V	—
Focus Voltage Minimum	-48 V	Grid4
Focus Voltage Maximum	264 V	Grid4
Grid1 Cutoff Voltage Minimum	-72 V	—
Grid1 Cutoff Voltage Maximum	-28 V	—
Maximum Grid1 Circuit Resistance	1.5 Mohm	—