

ELECTRONIC TUBE REFERENCE

14EP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Fourteen-inch P4 television picture tube using magnetic focusing and deflection, with white fluorescence, approximately 70-degree deflection, 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	14000 V
CRT-specific electrode/focus/deflection values retained in parameter rows.	

14EP4 — Rectangular Television Kinescope

An indirectly heated, rectangular picture tube featuring magnetic focus, magnetic deflection, and an ion-trap gun for television receiver applications.

Overview

The **14EP4** is a short, directly viewed, rectangular picture tube (kinescope) designed for use in television receivers. It features magnetic focus, magnetic deflection, a high-efficiency white fluorescent screen, and an ion-trap gun requiring an external single-field magnet. The tube's rectangular design allows for full reproduction of the transmitted television picture without wasting screen area, enabling more compact cabinet designs with approximately 20 percent less height than a round-face tube of equivalent picture

width. This design also allows the receiver chassis to remain flat without requiring a cutout or depression beneath the tube face.

Physical Construction and Screen Characteristics

The 14EP4 incorporates a rectangular glass bulb with a nominal picture area of 11-3/8" by 8-1/2" (with some specifications defining a raster size of 11-1/2" by 8-5/8"). The faceplate is constructed of Filterglass, which contains a neutral light-absorbing material. This material reduces ambient-light reflections from the phosphor and internal reflections within the faceplate itself at a much higher ratio than it reduces the directly viewed light of the picture, thereby significantly improving contrast under high ambient light conditions. The faceplate light transmission is rated between 65% and 66%.

The screen utilizes Phosphor No. 4-Sulfide Type, which exhibits white fluorescence and phosphorescence with a color temperature of approximately 7000 K. The phosphor has medium persistence, with its brightness not exceeding 7% of the peak value 33 milliseconds after excitation is removed.

Key physical dimensions of the 14EP4 include:

- **Overall Length:** 16-1/2" $\pm$ 3/8" (with a maximum length of 16-7/8")
- **Neck Length:** 7-3/16"
- **Greatest Diagonal at Face:** 13-11/16" $\pm$ 1/8" (maximum bulb diagonal of 13-13/16")
- **Greatest Width at Face:** 12-17/32" $\pm$ 1/8"
- **Greatest Height at Face:** 9-23/32" $\pm$ 1/8"

Electrical Specifications, Base, and Pinout

The 14EP4 is equipped with an indirectly heated, coated unipotential cathode. The heater is designed to operate on either AC or DC.

Heater Parameter	Value
Heater Voltage	6.3 V
Heater Current	0.6 A

The tube uses a **Small-Shell Duodecal 5-Pin base** (JETEC No. B5-57), which can fit either a duodecal 12-contact socket or a duodecal 5-contact segment socket. The socket should not be rigidly mounted and must have flexible leads to allow free movement.

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

- **Pin 1:** Heater
- **Pin 2:** Grid No. 1
- **Pin 10:** Grid No. 2
- **Pin 11:** Cathode
- **Pin 12:** Heater
- **Recessed Cavity Cap (JETEC No. J1-21):** Anode

The tube features both internal and external conductive coatings. The external conductive coating, when properly grounded, forms a high-voltage filter capacitor with the internal conductive coating on the bulb wall.

Direct Interelectrode Capacitances	Value
Grid No. 1 to all other electrodes	6 μF
Cathode to all other electrodes	5 μF
External conductive coating to Anode	750 min to 2000 max μF (typically 1250 μF)

Maximum Ratings and Typical Operating Conditions

The maximum ratings for the 14EP4 are established under the design-center system (and interpreted according to RMA Standard MB-210):

Parameter	Maximum Rating
Anode Voltage	14,000 V
Grid No. 2 Voltage	410 V
Grid No. 1 Negative Bias Voltage	125 V
Grid No. 1 Positive Bias Voltage	0 V
Grid No. 1 Positive Peak Voltage	2 V
Peak Heater-Cathode Voltage (Heater negative to cathode during warm-up $\leq 15\text{s}$)	410 V
Peak Heater-Cathode Voltage (Heater negative to cathode after warm-up)	150 to 180 V
Peak Heater-Cathode Voltage (Heater positive to cathode)	150 to 180 V
Grid No. 1 Circuit Resistance	1.5 $\text{M}\Omega$

Under typical operating conditions, the tube is operated with an anode voltage of 12,000 V and a Grid No. 2 voltage of 300 V. The Grid No. 1 voltage required for visual extinction of the undeflected focused spot ranges from -33 V to -77 V.

For focusing and beam alignment, the following typical values apply:

- **Focusing-Coil Current (DC):** $96 \pm 6\%$ mA (for a specimen coil similar to JETEC No. 109) or 110 $\pm 20\%$ mA.
- **Ion-Trap Magnet Field Strength:** 45 gauss at the center of a single-field magnet.

- **Ion-Trap Magnet Current (DC):** Approximately 70 mA (for a specimen magnet similar to JETEC No. 111) or $110 \pm 50\%$ mA.
- **Horizontal Deflecting Coil Current:** Approximately 750 mA.

Installation, Adjustment, and Safety Guidelines

Because of the short overall length of the 14EP4, the electron beam must be deflected through wide angles to scan the screen area. The nominal deflection angles are:

- **Diagonal:** 70°
- **Horizontal:** 65°
- **Vertical:** 50°

The deflecting yoke must have an effective length of not more than 1-11/16" and be designed so that the effective center of deflection is approximately 1.15 inches from the Reference Line. This prevents the electron beam from striking the neck of the tube.

The focusing field (supplied by an electromagnetic coil, permanent magnet, or a combination) must be spaced at least 1/2 inch from the end of the deflecting-coil windings to minimize interaction. The ion-trap magnet must be positioned in the region of Grid No. 2, with its north pole adjacent to vacant pin position No. 8 and its south pole to pin No. 2. It must be adjusted promptly upon applying operating voltages to obtain maximum raster brightness; operating the tube with an improperly aligned ion-trap magnet can cause rapid damage to the gun structure.

To protect the tube electrodes from damage due to high-voltage surges or internal arcing, the power supply should have inherent regulation limiting the continuous short-circuit current to 5 mA. If the supply can deliver an instantaneous short-circuit current exceeding 1 ampere or store more than 250 microcoulombs of charge, minimum series limiting resistances must be added:

- **Grid No. 1 Circuit:** 150 Ω minimum
- **Grid No. 2 Circuit:** 470 Ω minimum
- **Anode Circuit:** 16,000 Ω minimum

Additionally, the product of the anode voltage and the average anode current must be limited to 6 watts, with peak anode current restricted to 1 mA and average anode current to 0.250 mA.

Safety precautions must be strictly observed when operating the 14EP4. The tube contains a high vacuum and poses an implosion hazard; it should be handled with care and protected by a shatter-proof clear cover over the face of the receiver. High-voltage terminals must be enclosed, and interlocking switches should be used. When operated within its maximum ratings, the tube does not produce harmful x-ray radiation. However, if operated above 16 kV (absolute value), special shielding precautions against x-rays may be required. To prevent sparking, corona, and leakage currents, the uncoated glass surface around the anode cap must be kept clean, dry, and free of dust or fingerprints.

Technical Summary

The **14EP4** is a compact, rectangular television picture tube utilizing magnetic focus and magnetic deflection with a 70° diagonal deflection angle. It features a 6.3 V, 0.6 A heater, a high-efficiency Phosphor

No. 4-Sulfide Type white screen, and a Filterglass faceplate designed to maximize picture contrast under ambient light. Operating at a typical anode voltage of 12,000 V, the 14EP4 requires a single-field ion-trap magnet and careful alignment of its focusing and deflecting components to ensure uniform focus and prevent damage to its internal structure.



SOURCE OPERATING CONDITIONS

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1940 RCA

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1940 RCA

Section 1 · Cathode Ray

APPLICATION

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	TelevisionPictureTube text	—

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
ScreenDiagonal	14 in	—



SOURCE OPERATING CONDITIONS

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1961 Tung Sol

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1961 TUNG SOL

Section 1 · Cathode Ray

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
FocusingMethod	Magnetic	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DeflectingMethod	Magnetic	—
DeflectionAngleApproximate	70 degree	—
PhosphorNumber	4	—
FluorescentColor	White	—

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