

ELECTRONIC TUBE REFERENCE

12KP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Twelve-inch P4 cathode-ray display tube documented by General Electric. Available source detail is limited, so the tube is conservatively treated as a general direct-view display CRT without inferring more specialized service.

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
No fixed ratings recorded.

12KP4 — Magnetic Focus and Deflection Television Picture Tube

The **12KP4** is a direct-view cathode-ray picture tube designed for television receiver applications. It produces a 7.5 by 10-inch rectangular picture. The tube features a reflective metal-backed screen that prevents the formation of ion-spot blemishes while enhancing overall picture brightness, contrast, and detail. Additionally, it is constructed with an external conductive coating that, when connected to ground, functions as a high-voltage filter capacitor for the receiver's anode power supply.

Mechanical Construction and Physical Dimensions

The 12KP4 is built with a glass bulb envelope and a duodecal base. Its physical dimensions and mechanical features are precisely defined to ensure proper mounting, deflection yoke placement, and

focus coil alignment:

- **Overall Length:** $17 \frac{5}{8} \pm \frac{3}{8}$ inches
- **Greatest Diameter of Bulb:** $12 \frac{7}{16} \pm \frac{1}{8}$ inches
- **Minimum Useful Screen Diameter:** 11 inches
- **Nominal Picture Diagonal:** 11 inches
- **Neck Diameter:** $1 \frac{7}{16} \pm \frac{1}{16}$ inches
- **Anode Terminal:** J1-21 recessed small-cavity cap
- **Base Type:** Small-shell duodecal 7-pin base
- **Basing Designation:** 12D
- **Bulb Contact Alignment:** The recessed anode contact aligns with the vacant pin position No. 3 within an angular tolerance of ± 10 degrees.
- **Reference Line Determination:** The reference line is established by the position where a cylindrical limit gage with a diameter of 1.500 (+0.003 / -0.000) inches and a length of 2 inches rests against the bulb cone.
- **Reference Line Spacing:** The distance from the reference line to the front face of the tube is $7 \frac{5}{8} \pm \frac{3}{8}$ inches, and the distance from the reference line to the base tip is $10 \frac{1}{2} \pm \frac{3}{16}$ inches.
- **Effective Center of Deflection:** Located $\frac{3}{4} \pm \frac{3}{16}$ inches from the reference line toward the faceplate.
- **Anode Terminal Position:** Located $4 \frac{1}{4} \pm \frac{1}{4}$ inches from the reference line.

The screen is coated with P4 phosphor, which provides white fluorescence and medium persistence, making it suitable for standard television scanning rates.

Electrical Characteristics and Basing Configuration

The 12KP4 utilizes an indirectly heated, unipotential cathode. The electrical characteristics of the heater, the interelectrode capacitances, and the pinout connections are detailed below.

Heater Specifications

- **Heater Voltage:** 6.3 Volts AC or DC, with an allowable operating tolerance of $\pm 10\%$ (5.67 V to 6.93 V).
- **Heater Current:** 0.6 Ampere, with an allowable operating tolerance of $\pm 10\%$ (0.54 A to 0.66 A).
- **Heater-Cathode Connection:** The cathode must be returned to one side or to the electrical mid-tap of the heater transformer winding to prevent excessive potential differences and minimize hum injection.

Direct Interelectrode Capacitances

- **Cathode to All Other Electrodes:** Approximately 5 μf (pF).
- **Grid No. 1 to All Other Electrodes:** Approximately 6.5 μf (pF).
- **External Conductive Coating to Anode Capacitance:** 500 μf (pF) minimum to 2500 μf (pF) maximum.

Pinout Connections

The 12-pin duodecal base uses a 7-pin configuration (Basing [12D](#)). When viewed from the bottom of the base, the pin connections are assigned as follows:

Pin Number	Connection	Description
1	HEATER	Heater filament connection
2	GRID #1	Control grid
6	N.C.	No connection
7	N.C.	No connection
10	GRID #2	Screen grid (accelerating electrode)
11	CATHODE	Electron-emitting cathode
12	HEATER	Heater filament connection
Recessed Cap	ANODE	High-voltage anode terminal (aligns with vacant Pin 3 position)

Operating Conditions and Focus/Deflection Requirements

The 12KP4 requires external magnetic fields for both focusing the electron beam and deflecting it across the screen. The nominal deflection angle of the tube is approximately 54 degrees.

Typical Operating Parameters

Under typical operating conditions, the electrical and magnetic parameters are set as follows:

- **Anode Voltage:** 10,000 Volts D-C
- **Grid No. 2 Voltage:** 250 Volts D-C
- **Grid No. 1 Voltage:** -27 to -63 Volts D-C (adjusted to achieve visual extinction of the undeflected focused spot)
- **Focusing Coil Current:** Approximately 135 milliamperes D-C
- **Undeflected Spot Position:** 20 millimeters maximum deviation from the physical center of the screen

Focusing Coil Alignment and Setup

The typical focusing coil current of 135 mA is specified for a standard focus coil (or its equivalent) under the following conditions:

1. The distance (D) from the reference line of the tube to the center of the focusing coil's air-gap must be exactly 3 1/4 inches.
2. The combined Grid No. 1 bias voltage and the superimposed video-signal voltage must be adjusted to produce a high-light brightness of 20 foot-lamberts.
3. This brightness level is measured across the standard 7.5 x 10-inch picture area.

Maximum Ratings and Circuit Constraints

To prevent damage to the electrodes and ensure the longevity of the tube, circuit designs must strictly adhere to the design-center maximum ratings.

Design-Center Maximum Values

- **Anode Voltage:** 12,000 Volts D-C
- **Grid No. 2 Voltage:** 410 Volts D-C
- **Grid No. 1 Voltage:**
 - *Negative-Bias Value:* 125 Volts D-C
 - *Positive-Bias Value:* 0 Volts D-C
 - *Positive-Peak Value:* 2 Volts
- **Peak Heater-Cathode Voltage:**
 - *Heater Negative with Respect to Cathode:* 140 Volts D-C
 - *Heater Positive with Respect to Cathode:* 140 Volts D-C

Circuit Resistance Limits

- **Grid No. 1 Circuit Resistance:** The maximum allowable resistance in the control grid circuit is 1.5 Megohms. This limit is established to prevent bias instability that could arise from grid emission or residual gas currents.

Technical Summary

The **12KP4** is a specialized 11-inch diagonal television picture tube utilizing magnetic focus and magnetic deflection with a 54-degree deflection angle. It features a P4 white phosphor screen with medium persistence, a metal-backed screen to eliminate ion-spot blemishes, and an external conductive coating that acts as a filter capacitor when grounded. Operating at a typical anode voltage of 10,000 V D-C and a Grid No. 2 voltage of 250 V D-C, the tube requires a 6.3 V, 0.6 A heater supply. Its physical construction is based on a small-shell duodecal 7-pin base (12D basing) and a J1-21 recessed small-cavity cap for the high-voltage anode connection.

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