



ELECTRONIC TUBE REFERENCE

12GP7

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Twelve-inch P7 cathode-ray display tube documented by General Electric. The surviving approved source identifies the device but provides little extracted functional detail, so its classification is kept conservatively as a persistent-screen display CRT.

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

SECTION 1 Cathode Ray*No fixed ratings recorded.*

12GP7 Cathode-Ray Tube

The **12GP7** is an electrostatically focused and electrostatically deflected cathode-ray tube featuring a P7 phosphor screen. Sponsored by the General Electric Company and registered under RMA Release No. 380 on June 15, 1944, this tube is designed with a large-format screen and a multi-anode electrostatic lens system.

Physical Design and Geometry

The 12GP7 is characterized by its physical dimensions and precise alignment requirements necessary for accurate display calibration:

- **Overall Length:** $22 \pm 1/2$ inches
- **Greatest Diameter of Bulb:** $12 \pm 3/16$ inches

- **Minimum Usable Screen Diameter:** 10 inches
- **Bulb Contact:** Medium Metal Cap, which serves as the connection for Anode No. 3 (the supplementary high-voltage electrode).
- **Base:** Diheptal 12-Pin base.

Alignment and Trace Orientation

To ensure proper orientation of the projected image, the tube's internal structure is aligned relative to its external pins:

- The trace produced by deflecting electrodes D1 and D2 aligns with Pin No. 5 and the tube axis within ± 10 degrees.
- The angle between the D1-D2 trace and the D3-D4 trace is 90 degrees ± 4 degrees.
- Applying a positive voltage on deflecting electrode D1 (Pin 11) deflects the electron beam approximately toward Pin No. 5.
- Applying a positive voltage on deflecting electrode D3 (Pin 7) deflects the electron beam approximately toward Pin No. 2.
- The Anode No. 3 bulb contact aligns with the D1-D2 trace within ± 10 degrees.
- **Spot Center:** The undeflected, focused spot is guaranteed to fall within a 35 mm square centered at the geometric center of the tube face, with one side of the square parallel to the trace produced by D1 and D2.

Electrical Connections and Basing

The 12GP7 utilizes a Diheptal 12-Pin base with an RMA 14B basing designation. The heater is designed for a nominal supply of **6.3 V** at **0.6 A**, with an allowable variation of $\pm 10\%$ for both voltage and current.

The bottom view of the socket connections provides the following pin assignments:

Pin Number	Connection
1	Heater
2	Cathode
3	Grid (Control Electrode)
4	Internal Connection
5	Anode No. 1 (Focusing Electrode)
7	Deflecting Electrode D3
8	Deflecting Electrode D4
9	Anode No. 2 (High Voltage Electrode)
10	Deflecting Electrode <u>D2</u>

Pin Number	Connection
11	Deflecting Electrode <u>D1</u>
12	Internal Connection
14	Heater
Cap	Anode No. 3 (Supplementary High Voltage Electrode)

Note: Pins 6 and 13 are omitted from the active connections on this 12-pin configuration.

Interelectrode Capacitances

The direct interelectrode capacitances of the 12GP7 are specified with minimum and maximum limits to assist in circuit design and high-frequency performance evaluation:

Measurement Parameter	Minimum Value	Maximum Value
Cathode to all other electrodes	6.5 μpF	10.0 μpF
Grid No. 1 to all other electrodes	8.5 μpF	11.5 μpF
Deflecting electrode <u>D1</u> to deflecting electrode <u>D2</u>	1.5 μpF	5.0 μpF
Deflecting electrode D3 to deflecting electrode D4	1.5 μpF	5.0 μpF
Deflecting electrode <u>D1</u> to all other electrodes	5.0 μpF	13.0 μpF
Deflecting electrode D3 to all other electrodes	5.0 μpF	13.0 μpF
Deflecting electrode <u>D1</u> to all other electrodes except <u>D2</u>	5.0 μpF	10.0 μpF
Deflecting electrode <u>D2</u> to all other electrodes except <u>D1</u>	5.0 μpF	10.0 μpF
Deflecting electrode D3 to all other electrodes except D4	3.0 μpF	9.0 μpF
Deflecting electrode D4 to all other electrodes except D3	3.0 μpF	9.0 μpF

Operating Conditions and Deflection Characteristics

The 12GP7 can be operated under several typical voltage combinations depending on the desired brightness, focus, and deflection sensitivity. Symmetrical deflection voltage must be used across the deflecting electrodes.

The table below outlines four typical operating points:

Parameter	Condition I	Condition II	Condition III	Condition IV
Anode No. 3 Voltage	3000 V	6000 V	4000 V	6000 V
Anode No. 2 Voltage	3000 V	3000 V	4000 V	4000 V
Anode No. 1 Voltage	857 V	857 V	1143 V	1143 V
Grid No. 1 Voltage	-98 V	-98 V	-130 V	-130 V
<u>D1-D2</u> Deflection Factor	73 V D-c/in	89 V D-c/in	97 V D-c/in	108 V D-c/in
D3-D4 Deflection Factor	68 V D-c/in	83 V D-c/in	91 V D-c/in	101 V D-c/in

Operating Notes and Tolerances

- **Anode No. 1 (Focusing) Voltage:** The nominal focusing voltage is specified at 75% of the grid voltage required for cutoff. The actual focusing voltage has an allowable tolerance of +25% to -30%. These tolerances account for variations in focusing voltage when the grid voltage is adjusted between zero and the cutoff point.
- **Grid No. 1 (Control) Voltage:** The typical values listed (e.g., -98 V and -130 V) represent the voltage necessary for the visual extinction of a stationary focused spot. The cutoff voltage has an allowable variation of $\pm 50\%$.
- **Deflection Factors:** The deflection factors for both electrode pairs (D1-D2 and D3-D4) are subject to a tolerance of $\pm 20\%$.

Maximum Ratings

To prevent damage to the tube and ensure reliable operation, the following absolute maximum limits must be observed:

- **Anode No. 3 (Supplementary High Voltage Electrode) Voltage:** 6600 Volts

- **Anode No. 2 (High Voltage Electrode) Voltage:** 4400 Volts
- **Anode No. 1 (Focusing Electrode) Voltage:** 2200 Volts
- **Grid No. 1 (Control Electrode) Voltage:** Never Positive
- **Peak Voltage between Anode No. 2 and any Deflecting Electrode:** 1100 Volts
- **D-c Heater-Cathode Potential (with heater negative):** -250 Volts
- **Impedance of any Deflecting Electrode Circuit (at heater supply frequency):** 1.0 Megohm
- **Grid Circuit Resistance:** 1.5 Megohms

When operating with a negative heater-to-cathode potential, the cathode should be tied directly to a center tap or to one side of the heater supply.

Technical Summary

The **12GP7** is a 12-inch electrostatic-focus, electrostatic-deflection cathode-ray tube utilizing a P7 phosphor screen. Operating with a standard 6.3 V, 0.6 A heater, it features a multi-anode design with a maximum supplementary high-voltage rating (Anode No. 3) of 6600 V. Its physical construction relies on a 12-pin Diheptal base (RMA 14B) and a medium metal cap bulb contact. Symmetrical deflection voltages are required, yielding typical deflection factors ranging from 68 to 108 Volts D-c per inch depending on the chosen anode operating potentials.

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