

ELECTRONIC TUBE REFERENCE

12ACP2

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Twelve-inch cathode-ray display tube using electrostatic focusing and electrostatic deflection. Its aluminized P2 screen produces yellow-green/green fluorescence with long persistence, making it useful for direct-view oscillographic and instrumentation displays.

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.
Representative electron-beam display section; repeated beam systems are electrically similar.

12ACP2 — Dual-Beam Electrostatic Cathode-Ray Tube

The **12ACP2** is a specialized 12.5-inch diameter, dual-beam cathode-ray tube designed for applications requiring independent dual-trace displays with high tracking accuracy and minimal spot defocusing. It features electrostatic focus and electrostatic deflection for both of its independent electron gun assemblies. The tube is constructed with an aluminized screen utilizing Phosphor No. 2, which provides a green fluorescent color, a green phosphorescent color, and long persistence. The aluminized backing enhances light output and stabilizes the screen potential during operation.

Mechanical Design and Physical Dimensions

The physical structure of the 12ACP2 is characterized by a large-format bulb with a clear, flat faceplate. The mechanical dimensions and alignment tolerances are tightly controlled to ensure precise display geometry:

- **Overall Length:** $24 \frac{7}{8} \pm \frac{3}{8}$ inches
- **Greatest Bulb Diameter:** $12 \frac{7}{16} \pm \frac{1}{16}$ inches
- **Minimum Useful Screen Diameter:** 11 inches
- **Bulb Contact:** J1-22
- **Neck Contacts:** Ten J1-25 contacts
- **Base:** B12-37 (Medium Shell 12-Pin Diheptal Base)
- **Basing Configuration:** Special

Alignment and Trace Orthogonality

To maintain precise alignment between the physical base, the bulb contacts, and the electron beam traces, the following mechanical tolerances are specified:

- **Bulb Contact Alignment:** The J1-22 bulb contact aligns with the trace produced by the D1D2 deflection plates within ± 10 degrees. This contact is positioned on the same side of the tube as Pin #4 of the base.
- **Base Alignment:** The D1D2 trace aligns with Pin #4 and the longitudinal tube axis within ± 10 degrees.
- **Deflection Direction:** A positive voltage applied to the D1 deflection plate deflects the electron beam approximately toward Pin #4. A positive voltage applied to the D3 deflection plate deflects the beam approximately toward Pin #1.
- **Trace Orthogonality:** The angle between the D3D4 and D1D2 deflection traces is maintained at 90 ± 1 degrees.
- **Reference Line:** Defined as the point where a ring gauge with a diameter of 5.750 ± 0.003 inches will stop.

Heater and Basing Connections

The 12ACP2 contains two completely independent electron gun structures, designated as Gun A and Gun B. Each gun is equipped with its own heater, cathode, control grid (Grid No. 1), and focusing electrode. The heaters are designed for parallel or independent operation from a nominal 6.3 V supply.

Heater Specifications

- **Heater Voltage:** 6.3 Volts
- **Heater Current:** $0.6 \pm 10\%$ Ampere per gun

Base Pin Connections (B12-37 Diheptal Base)

The 12-pin diheptal base provides electrical connections to the internal gun electrodes:

Pin Number	Connection
Pin 1	Heater (Gun A)
Pin 2	Cathode (Gun A)
Pin 3	Grid No. 1 (Gun A)
Pin 5	Focusing Electrode (Gun A)
Pin 7	Heater (Gun B)
Pin 8	Heater (Gun B)
Pin 9	Cathode (Gun B)
Pin 10	Grid No. 1 (Gun B)
Pin 12	Focusing Electrode (Gun B)
Pin 14	Heater (Gun A)

The deflection plates (D1, D2, D3, D4) for both Gun A and Gun B, along with additional accelerator (A2) terminals, are routed to the ten J1-25 neck contacts. For proper operation, all accelerator terminals must be connected together externally.

Direct Interelectrode Capacitances

The direct interelectrode capacitances for each individual gun unit are approximately as follows:

- **Cathode to all other electrodes:** 4.7 μF
- **Grid #1 to all other electrodes:** 4.0 μF
- **D1 to D2:** 2.4 μF
- **D3 to D4:** 1.4 μF
- **D1 to all other electrodes:** 2.4 μF
- **D2 to all other electrodes:** 2.4 μF
- **D3 to all other electrodes:** 1.5 μF
- **D4 to all other electrodes:** 1.5 μF

Absolute Maximum Ratings

The following ratings are design center values and represent the maximum limits for safe and reliable operation of each gun unit:

- **Accelerator Voltage:** 10,000 Max. Volts DC
- **Focusing Electrode Voltage:** 4,000 Max. Volts DC
- **Grid #1 Voltage (Negative Bias Value):** 300 Max. Volts DC
- **Grid #1 Voltage (Positive Bias Value):** 0 Max. Volts DC

- **Grid #1 Voltage (Positive Peak Value):** 0 Max. Volts
- **Peak Heater-Cathode Voltage (Heater negative with respect to cathode):** 180 Max. Volts
- **Peak Heater-Cathode Voltage (Heater positive with respect to cathode):** 180 Max. Volts
- **Peak Voltage between Accelerator and any Deflection Electrode:** 2,500 Max. Volts
- **Grid #1 Circuit Resistance:** 1.5 Max. Megohms
- **Resistance in any Deflecting-Electrode Circuit:** 5.0 Max. Megohms

Typical Operating Conditions and Performance

Under typical operating conditions, the 12ACP2 exhibits the following electrical and optical characteristics per gun unit:

- **Accelerator Voltage:** 7,500 Volts
- **Focusing Electrode Voltage:** 1,750 to 2,500 Volts
- **Grid #1 Voltage (for visual extinction of the focused, undeflected spot):** -150 to -225 Volts
- **Deflection Factors (D1 and D2):** 140 to 190 Volts DC per Inch
- **Deflection Factors (D3 and D4):** 130 to 180 Volts DC per Inch
- **Line Width "A":** 0.015 Inch Maximum (measured at a beam current of 2 μ ADC, with 1000 Volts applied to either D1 or D2, and Grid #1 bias adjusted until the respective plate collects 2 μ A)
- **Spot Position:** Within a 5/8-inch radius circle centered on the tube face when operated under typical conditions, with Grid #1 bias adjusted to prevent screen damage, all deflecting electrodes tied to the accelerator, and the tube shielded from external magnetic and electrical fields.

Tracking and Focus Quality

The 12ACP2 is engineered to maintain high registration and focus quality across the screen area:

- **Tracking Accuracy:** The physical registry between the two independent electron guns is designed so that the distance between the two spots never exceeds 0.15 inch at any point within an 11-inch diameter circle on the screen. To achieve this level of accuracy, small compromise adjustments may be made in the electrical "zero-centering" of the spots (allowing an electrical offset of up to 0.15 inch in any direction) and in the electrical deflection-voltage ratios.
- **Defocusing Limits:** Spot defocusing is minimized within the central 11-inch diameter area of the screen. The degradation in spot size anywhere within this circle, compared to the spot size at compromise focus, will not exceed a ratio of 1.5 to 1.

Beam Interaction and Isolation

To ensure that the deflection of one beam does not interfere with the position or shape of the other, the interaction between the two deflection systems is held to an absolute minimum. This isolation is verified using a standardized test procedure:

1. The tube is mounted such that the deflection plates closest to the screen produce vertical traces.
2. The electron beam from the righthand gun (Gun A, viewed from the face) is positioned horizontally to a point 5 inches to the left of the geometric center of the tube using a DC bias voltage.

3. The electron beam from the lefthand gun (Gun B) is deflected vertically over a total distance of 10 inches by a 60-cycle AC sinewave voltage.
4. Under these conditions, the resulting peak-to-peak vertical excursion of the Gun A beam caused by the vertical deflection of the Gun B beam must be less than 0.05 inch.
5. Conversely, when the Gun B beam is positioned 5 inches to the right of the center and the Gun A beam is swept vertically by a 60-cycle AC sinewave voltage, the peak-to-peak vertical excursion of the Gun B beam must be less than 0.05 inch.
6. During these interaction tests, all unused deflection plates must be connected directly to the accelerator.

Technical Summary

The **12ACP2** is a high-precision, 12.5-inch dual-beam cathode-ray tube featuring electrostatic focus and deflection. It incorporates two independent electron gun assemblies, each utilizing a 6.3 V, 0.6 A heater, and sharing a common clear faceplate with an aluminized Phosphor No. 2 screen. This phosphor configuration provides a green fluorescent and phosphorescent display with long persistence, making it highly suitable for slow-scan or continuous monitoring applications.

With an accelerator rating of up to 10,000 V and a focusing electrode limit of 4,000 V, the tube delivers sharp, well-defined traces. Its design emphasizes exceptional tracking accuracy (within 0.15 inch), minimal spot defocusing (less than 1.5 to 1 degradation within an 11-inch circle), and outstanding isolation between the two deflection systems (less than 0.05 inch of cross-beam interaction). The electrical connections are split between a B12-37 diheptal base and ten J1-25 neck contacts, providing robust and reliable operation in dual-trace oscilloscope and display systems.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1960 Du Mont

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

1960 DU MONT

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	Electrostatic text	—
Phosphor	P2 text	—
Fluorescence	Yellow-green/green text	—
Persistence	Long text	—
Screen Construction	Aluminized/metal-backed text	—

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