



ELECTRONIC TUBE REFERENCE

12AQP2

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

CATHODERAY

Electrostatically focused and deflected cathode-ray display tube with an aluminized P2 screen, providing yellow-green to green fluorescence with long persistence.

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.**Cathode-ray display/electron-gun section.*

12AQP2 Cathode-Ray Tube

The **12AQP2** is a 12 7/16-inch diameter, single-beam, electrostatic focus and electrostatic deflection cathode-ray tube designed for fast writing rates and high-speed radar display applications. It features a post-acceleration design to maximize deflection sensitivity under high overall accelerating voltages, a specially designed low-drive electron gun compatible with transistorized video circuitry, and a specialized deflection structure that minimizes spot defocusing. The "2" suffix in the 12AQP2 designation indicates the integration of Phosphor No. 2, providing a green fluorescent and phosphorescent display with long persistence. During its development phase, this tube family was designated under the tentative type number **K2007P** (or **K-2007P**).

Optical and Screen Characteristics

The 12AQP2 is characterized by its specific screen chemistry and optical performance, which are tailored for radar and high-speed display systems:

- **Phosphor Type:** No. 2 (P2)
- **Fluorescent Color:** Green
- **Phosphorescent Color:** Green
- **Persistence:** Long
- **Faceplate:** Clear glass
- **Screen Construction:** Aluminized. The aluminized backing increases light output and minimizes screen charging effects during operation.

Other members of the 12AQP- family utilize different phosphors to suit alternative display requirements, such as Phosphor No. 7 (blue/yellow, long persistence), Phosphor No. 11 (blue, short persistence), Phosphor No. 14 (blue/orange, long persistence), Phosphor No. 19 (orange/orange, very long persistence), and Phosphor No. 25 (orange/orange, very long persistence). For comparison, when operating a P19 screen under static conditions, the screen current must be restricted to a maximum of 5 μ ADC to prevent severe and permanent damage, highlighting the specialized nature of these phosphor formulations.

Mechanical Specifications and Base Alignment

The physical structure of the 12AQP2 is designed for precise mechanical alignment within radar display consoles:

- **Overall Length:** 25 5/8 $\pm$ 3/8 inches
- **Greatest Bulb Diameter:** 12 7/16 $\pm$ 1/8 inches
- **Minimum Useful Screen Diameter:** 11.0 inches
- **Bulb Contact:** J1-22 high-voltage contact cap (for the post-accelerator connection)
- **Base:** Medium Shell 14-Pin Diheptal Base (B14-38)
- **Basing Configuration:** Special 14AX arrangement

Pin Connection Table

Pin Number	Element Connection
1	Heater
2	Cathode
3	Grid No. 1
4	Modulation Adjustment Electrode
5	Focusing Electrode
6	No Connection

Pin Number	Element Connection
7	Deflecting Electrode D3
8	Deflecting Electrode D4
9	Accelerator
10	Deflecting Electrode <u>D2</u>
11	Deflecting Electrode <u>D1</u>
12	Astigmatism Electrode
13	No Connection
14	Heater
Cap (J1-22)	Post Accelerator

Alignment Tolerances

- **Trace Alignment:** The D1D2 trace aligns with Pin No. 1 and the tube axis within ± 10 degrees. The angle between the D3D4 and D1D2 traces is maintained at 90 ± 1 degrees.
- **Deflection Direction:** A positive voltage applied to D1 deflects the electron beam approximately toward Base Pin No. 1. A positive voltage applied to D3 deflects the beam approximately toward Base Pin No. 11.
- **Bulb Contact Alignment:** The J1-22 cap aligns with Pin Position No. 1 within ± 5 degrees, aligns with the D1D2 trace within ± 5 degrees, and is positioned on the same side of the bulb as Pin No. 1.

Electrical Ratings

The following Design Center Values represent the maximum limits within which the 12AQP2 can be safely and reliably operated:

Parameter	Maximum Rating	Unit
Post Accelerator Voltage	16,000	Max. Volts DC
Accelerator Voltage	8,000	Max. Volts DC
Astigmatism Electrode Voltage	8,000	Max. Volts DC
Ratio of Post Accelerator to Accelerator Voltage	2.0	Max. Ratio
Focusing Electrode Voltage	3,000	Max. Volts DC
Modulation Adjustment Electrode Voltage	300	Max. Volts DC

Parameter	Maximum Rating	Unit
Accelerator Input Power	6	Max. Watts
Grid No. 1 Negative Bias Value	300	Max. Volts DC
Grid No. 1 Positive Bias Value	0	Max. Volts DC
Grid No. 1 Positive Peak Value	0	Max. Volts
Peak Voltage between Accelerator and any Deflection Electrode	1,500	Max. Volts

Heater and Heater-Cathode Ratings

- **Heater Voltage:** 6.3 Volts
- **Heater Current (at 6.3 V):** 0.6 Ampere $\pm$ 10%
- **Peak Heater-Cathode Voltage (Heater negative with respect to cathode):**
 - During warm-up period (not to exceed 15 seconds): 410 Max. Volts
 - After equipment warm-up period: 180 Max. Volts
- **Peak Heater-Cathode Voltage (Heater positive with respect to cathode):** 180 Max. Volts

Typical Operating Conditions

Under typical operating conditions, the 12AQP2 is configured with a post-accelerator to accelerator voltage ratio of 2.0 to ensure optimum deflection uniformity and pattern geometry.

- **Post Accelerator Voltage:** 10,000 Volts DC
- **Accelerator Voltage:** 5,000 Volts DC
- **Astigmatism Electrode Voltage:** 5,000 Volts DC. The astigmatism electrode is adjusted for optimum spot shape, typically falling within the range of -300 to +300 Volts with respect to the accelerator voltage.
- **Focusing Electrode Voltage:** 1,350 to 1,650 Volts DC (measured at an anode No. 3 current of 25 μ ADC).
- **Grid No. 1 Voltage:** -10 Volts DC (for visual extinction of the undeflected, focused spot).
- **Modulation Adjustment Electrode Voltage:** 30 to 100 Volts DC. This electrode is adjusted to establish a Grid No. 1 voltage of -10 Volts for spot extinction.
- **Deflection Factors:**
 - **D1D2:** 95 to 105 Volts DC per Inch
 - **D3D4:** 81 to 90 Volts DC per Inch
- **Modulation:** 10 Max. Volts DC (for an anode No. 3 current of 45 μ ADC).
- **Line Width:** 0.025 Max. Inch (measured at an anode No. 3 current of 25 μ ADC).
- **Deflection Defocusing:** The ratio of the line width at 25 μ A anode No. 3 current at maximum deflection to that at the center of the tube does not exceed 1.5:1 when utilizing focusing and

astigmatism correction.

- **Focusing Electrode Current:** -15 to +10 μA under any operating condition.
- **Spot Position:** The focused spot falls within a 25-mm square centered on the tube face when the free deflecting electrodes are connected to the accelerator and the tube is shielded against external magnetic and electrical influences.

Maximum Circuit Values

- **Grid No. 1 Circuit Resistance:** 1.5 Max. Megohms
- **Deflecting-Electrode Circuit Resistance:** 5.0 Max. Megohms in any deflecting-electrode circuit. It is recommended that the resistances in all deflecting-electrode circuits be approximately equal.

Interelectrode Capacitances

The approximate direct interelectrode capacitances of the 12AQP2 are as follows:

- **Cathode to all other electrodes:** 4.5 pF
- **Grid No. 1 to all other electrodes:** 13.0 pF
- **D1 to D2:** 4.6 pF
- **D3 to D4:** 2.2 pF
- **D1 to all other electrodes:** 14.0 pF
- **D2 to all other electrodes:** 14.0 pF
- **D3 to all other electrodes:** 6.4 pF
- **D4 to all other electrodes:** 6.0 pF
- **Modulation Electrode to all other electrodes:** 9.1 pF

Technical Summary

The **12AQP2** is a high-performance, 12 7/16-inch electrostatic focus and deflection cathode-ray tube optimized for high-speed radar displays. By utilizing a post-accelerator design with a typical operating voltage of 10,000 V and an accelerator voltage of 5,000 V, it achieves excellent deflection sensitivity (95 to 105 V/inch on D1D2 and 81 to 90 V/inch on D3D4) while maintaining a sharp, well-focused spot (maximum line width of 0.025 inch). Its low-drive electron gun is specifically designed to interface with transistorized video drive circuitry, and its aluminized Phosphor No. 2 screen provides a long-persistence green display suitable for continuous radar sweep observation. The tube is housed in a glass envelope with a Medium Shell 14-Pin Diheptal base and requires a standard 6.3 V, 0.6 A heater supply.



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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