

ELECTRONIC TUBE REFERENCE

12AXP7

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Cathode-ray display tube documented by manufacturer data for type 12AXP7; available extracted source information is sparse, so no more specialized application or construction claim is made.

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	6000 V
Cathode-ray display tube; section represents the electron-gun/display system.	

12AXP7 — Electrostatic Deflection and Focus Cathode Ray Tube

A 12-inch direct-viewed, round glass-type cathode ray tube featuring electrostatic deflection, electrostatic focus, and post-deflection acceleration, equipped with a long-persistence P7 phosphor screen for oscilloscope and radar display applications.

Overview

The **12AXP7** is a specialized 12-inch cathode ray tube (CRT) designed for precision oscilloscope and visual display systems. It utilizes electrostatic focus and electrostatic deflection to control the electron beam, along with post-deflection acceleration (via a high-voltage post-accelerator anode, Anode No. 3) to achieve high trace brightness and definition.

The "P7" designation indicates that this specific variant is equipped with a dual-layer phosphor screen that provides white fluorescence, yellow phosphorescence, and long persistence. This makes the 12AXP7 highly suitable for displaying slow-moving waveforms, transient signals, or low-repetition-rate phenomena that require trace retention over time.

Phosphor and Screen Characteristics

The 12AXP7 features a flat-faced, round gray filter glass faceplate with a minimum useful screen diameter of 11 inches. The P7 phosphor screen is optimized for long-duration visual observation. Its primary characteristics include:

- **Fluorescence (Initial Emission):** White
- **Phosphorescence (Afterglow):** Yellow
- **Persistence:** Long

This long-persistence characteristic allows the trace to remain visible on the screen long after the electron beam has passed, which is critical for low-speed sweep applications. Other phosphor options in the same tube family include P1 (medium-persistence green), P2 (medium-persistence green), and P11 (short-persistence blue), but the 12AXP7 specifically designates the P7 configuration.

Mechanical Design and Physical Dimensions

The 12AXP7 is constructed with a robust round glass envelope (C99 1/2 Exp. 28 or equivalent) and weighs approximately 12 pounds. The physical dimensions and mechanical alignments are tightly controlled to ensure accurate display geometry:

- **Overall Length:** $22 \frac{1}{4} \pm \frac{3}{8}$ inches
- **Bulb Diameter:** $12 \frac{7}{16} \pm \frac{3}{16}$ inches
- **Neck Outer Diameter:** $2 \pm \frac{3}{32}$ inches
- **Deflection Neck Section Outer Diameter:** $3 \frac{3}{4} \pm \frac{3}{16}$ inches
- **Seated Length (to Reference Line):** $14 \frac{3}{8} \pm \frac{3}{8}$ inches
- **Minimum Useful Screen Diameter:** 11 inches

Electrical connection to the high-voltage post-accelerator anode (Anode No. 3) is made via a recessed small cavity cap (J1-21) located on the side of the bulb. The alignment of this J1-21 contact is critical for proper installation:

- The J1-21 contact aligns with the D1-D2 trace within ± 10 degrees.
- The J1-21 contact aligns with base Pin No. 5 within ± 10 degrees.

Beam deflection is oriented such that a positive voltage applied to deflecting plate D1 deflects the electron beam approximately toward Pin No. 5, while a positive voltage applied to deflecting plate D3 deflects the beam approximately toward Pin No. 1.

Heater and Interelectrode Capacitances

The tube contains an indirectly heated, unipotential cathode. The heater is designed to operate from either an AC or DC source with the following nominal ratings:

- **Heater Voltage:** 6.3 V
- **Heater Current:** 0.6 A $\pm$ 10%
- **Calculated Heater Power:** 3.78 W (calculated as 6.3 V $\times$ 0.6 A)

To prevent high-frequency signal degradation and cross-coupling between deflection channels, the tube is designed with low direct interelectrode capacitances:

Interelectrode Measurement	Capacitance (Approx.)
Cathode to All Other Electrodes	10 pF
Grid No. 1 to All Other Electrodes	8 pF
Between Deflecting Plates 1-2 (D1-D2)	4 pF
Between Deflecting Plates 3-4 (D3-D4)	2 pF
Deflecting Plate 1 to All Other Electrodes Except <u>D2</u>	8 pF
Deflecting Plate 2 to All Other Electrodes Except <u>D1</u>	8 pF
Deflecting Plate 3 to All Other Electrodes Except D4	6 pF
Deflecting Plate 4 to All Other Electrodes Except D3	6 pF

Basing and Pin Connections

The 12AXP7 utilizes a 12-pin Medium Shell Diheptal base (B12-37) with a **14J** basing configuration. The pin assignments, viewed from the bottom of the base, are as follows:

- **Pin 1:** Heater (H)
- **Pin 2:** Cathode (K)
- **Pin 3:** Grid No. 1 (G1)
- **Pin 4:** Internal Connection (IC) — Do not use
- **Pin 5:** Anode No. 1 (A1) [Focusing Electrode]
- **Pin 7:** Deflecting Plate 3 (D3)
- **Pin 8:** Deflecting Plate 4 (D4)
- **Pin 9:** Anode No. 2 (A2) / Grid No. 2 (G2)
- **Pin 10:** Deflecting Plate 2 (D2)

- **Pin 11:** Deflecting Plate 1 ([D1](#))
- **Pin 12:** No Connection (NC)
- **Pin 14:** Heater (H)
- **Recessed Cavity Cap (J1-21):** Anode No. 3 (A3) [Post-Deflection Accelerator]

Absolute Maximum Ratings

Operating the tube beyond these absolute maximum values can cause permanent damage or severely shorten its operational life. All voltages are specified with respect to the cathode unless otherwise noted:

- **Anode Input:** 6 Watts (defined as the product of the Anode No. 2 voltage and the average Anode No. 2 current)
- **Anode No. 3 (Post-Accelerator) Voltage:** 12,000 V dc
- **Anode No. 2 Voltage:** 6,000 V dc
- **Anode No. 1 (Focusing Electrode) Voltage:** 2,500 V dc
- **Grid No. 1 Voltage:**
 - **Negative Bias Value:** 200 V dc
 - **Positive Bias Value:** 0 V dc
 - **Positive Peak Value:** 2 V
- **Peak Heater-Cathode Voltage:**
 - **Heater Negative with Respect to Cathode:** 200 V
 - **Heater Positive with Respect to Cathode:** 200 V
- **Peak Voltage Between Anode No. 2 and Any Deflecting Plate:** 750 V
- **Ratio of Post-Accelerator Voltage to Anode Voltage (A3 to A2):** 2.3:1 maximum

Typical Operating Conditions

Under typical operating conditions, the 12AXP7 is biased to balance deflection sensitivity with trace brightness and focus quality. The typical parameters are:

- **Anode No. 3 Voltage:** 10,000 V dc
- **Anode No. 2 Voltage:** 5,000 V dc
- **Anode No. 1 Voltage for Focus:** 1,300 to 2,200 V dc
- **Grid No. 1 Voltage Required for Cutoff:** -60 to -100 V dc (for visual extinction of an undeflected, focused spot)
- **Deflection Factors:**
 - **Deflecting Plates 1-2 (D1-D2, nearer the screen):** 105 to 145 V dc/Inch
 - **Deflecting Plates 3-4 (D3-D4):** 80 to 115 V dc/Inch
- **Modulation:** 30 V maximum (measured at a post-accelerator current of 25 μ A in accordance with MIL-E-1 specifications)
- **Line Width "A":** 0.5 mm (measured at 25 μ A post-accelerator current)
- **Focus Electrode Current:** -15 to +10 μ A dc
- **Spot Position, Undeflected:** Within a 30 mm square centered on the tube face

- **Angle Between D1-D2 Trace and D3-D4 Trace:** 90 ± 2 Degrees
- **Useful Scan (Centered on Tube Face):** Minimum of $9 \frac{3}{4} \times 9 \frac{3}{4}$ inches. When the post-accelerator voltage is equal to the Anode No. 2 voltage ($EA3 = EA2$), the entire useful screen area can be scanned.

Under these typical conditions, the ratio of post-accelerator voltage to Anode No. 2 voltage is calculated as $10,000 \text{ V} / 5,000 \text{ V} = 2.0:1$, which is well within the absolute maximum limit of 2.3:1.

Circuit Design Values

To ensure stable electrostatic focus and deflection, the external drive circuitry must comply with the following maximum resistance limits:

- **Grid No. 1 Circuit Resistance:** 1.5 Megohms maximum
- **Resistance in Any Deflection Plate Circuit:** 5.0 Megohms maximum

These limits prevent the accumulation of stray electrostatic charges on the control grid and deflection plates, which could otherwise cause spot drift, defocusing, or pattern distortion.

Technical Summary

The **12AXP7** is a high-performance, 12-inch electrostatic-focus, electrostatic-deflection cathode ray tube featuring post-deflection acceleration and a long-persistence P7 phosphor screen. Operating with a typical post-accelerator potential of 10,000 V and an Anode No. 2 potential of 5,000 V, it provides a large, highly visible display area with a minimum useful scan of $9 \frac{3}{4} \times 9 \frac{3}{4}$ inches. Its electrical and mechanical design, including the 12-pin diheptal base and side-mounted high-voltage cap, is optimized for precision oscilloscope and waveform monitoring applications requiring the retention of slow or transient signals.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	6.3 V	—
Heater current	600 mA	—
Anode input maximum	6 W	—
Anode No. 2 voltage maximum	6000 V	—
Anode No. 1 voltage maximum	2500 V	—
Anode No. 3 voltage	10000 V	—
Grid No. 1 cutoff voltage	-60 to -100 V	—
Heater-cathode peak voltage	200 V	—