

Twelve-inch direct-view oscilloscope cathode-ray tube with electrostatic focus and deflection and post-deflection acceleration. Gray-filter glass and an aluminized screen complement its high-voltage multi-anode system for instrument-display service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	14AW	BASE PINS	12
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.
Cathode-ray display tube; section represents the electron-gun/display system.

12ANP25 — Electrostatic Deflection and Focus Oscilloscope Tube

Overview

The **12ANP25** is a 12-inch, direct-viewed, round glass cathode-ray tube (CRT) designed for precision oscilloscope and display applications. It features electrostatic deflection, electrostatic focus, post-deflection acceleration, and an aluminized screen. The "25" suffix in the designation indicates the use of the **P25** phosphor screen, which exhibits orange fluorescence and orange phosphorescence with long persistence. The tube is also available with other phosphors (such as P7, P14, and P19) under the broader 12ANP- family to suit different visual and photographic requirements.

Mechanical Design and Physical Dimensions

The 12ANP25 is constructed with a robust round glass envelope. Its physical dimensions and mechanical alignment parameters are tightly controlled to facilitate precise mounting and calibration within display instruments.

Physical Dimensions

- **Overall Length:** 22 1/2 ± 3/8 inches
- **Nominal Neck Length (to C.D. Line):** 14 3/8 inches
- **Bulb Diameter:** 12 7/16 inches (with a tolerance of +1/16 and -3/32 inches)
- **Minimum Useful Screen Diameter:** 11 inches
- **Neck Diameter:** 2 3/16 ± 1/16 inches
- **Faceplate Radius of Curvature:** 40 inches
- **Funnel Radius:** 24 inches

Base and External Contacts

The tube uses a **Medium Shell Diheptal 12-Pin base (B12-37)** with a **14AW** basing configuration. To minimize interelectrode capacitance and handle high operating voltages, several critical connections are routed through external bulb and neck contacts rather than the base pins:

- **Bulb Contact:** A recessed small cavity cap (**J1-22**) located on the funnel of the tube provides the connection for Anode No. 3 (the post-accelerator).
- **Neck Contacts:** Five small ball caps (**J1-25**) located around the neck of the tube provide direct connections to Anode No. 2 (A2) and the four deflecting plates (D1, D2, D3, and D4).

Alignment and Deflection Geometry

The physical alignment of the contacts relative to the internal deflection structure is specified as follows:

- The **J1-22 bulb contact** aligns with the D3-D4 trace within ±10 degrees and with base **Pin No. 11** within ±10 degrees.
- The **A2 neck contact** aligns with the D1-D2 trace within ±10 degrees.
- The nominal angle between the D1-D2 trace and the D3-D4 trace is 90 ± 1 degree, ensuring orthogonal horizontal and vertical deflection.
- A positive voltage applied to deflecting plate D1 deflects the electron beam approximately away from the **A2** neck contact.
- A positive voltage applied to deflecting plate **D3** deflects the beam approximately away from the post-accelerator button (**J1-22**).

Heater and Electrical Connections

The 12ANP25 contains an indirectly heated, coated unipotential cathode. The heater is designed to operate from either an AC or DC source.

Heater Parameter	Value
Nominal Heater Voltage	6.3 V
Heater Current	0.6 ± 10% A

Basing Pinout (14AW)

The base connections, viewed from the bottom of the tube, are assigned as follows:

- **Pin 1:** Heater (H)
- **Pin 2:** Cathode (K)
- **Pin 3:** Grid No. 1 (G1)
- **Pin 5:** Anode No. 1 (A1 / Focus Electrode)
- **Pin 14:** Heater (H)
- *Pins 4, 6, 7, 8, 9, 10, 11, 12, and 13 have no external connection.*

The high-voltage anodes and deflection plates are connected via the external caps:

- **J1-22 Bulb Cap:** Anode No. 3 (Post-Accelerator)
- **J1-25 Neck Caps:** Anode No. 2 (A2), Deflecting Plate 1 ([D1](#)), Deflecting Plate 2 ([D2](#)), Deflecting Plate 3 (D3), Deflecting Plate 4 (D4)

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12ANP25 are approximately:

Electrode Configuration	Capacitance (Approx.)
Cathode to All Other Electrodes	6.0 pF
Grid No. 1 to All Other Electrodes	8.0 pF
Between Deflecting Plates 1-2	5.0 pF
Between Deflecting Plates 3-4	3.0 pF
Deflecting Plate 1 to All Other Electrodes	14.5 pF
Deflecting Plate 2 to All Other Electrodes	13.0 pF
Deflecting Plate 3 to All Other Electrodes	6.2 pF
Deflecting Plate 4 to All Other Electrodes	6.5 pF

Absolute Maximum Ratings

The following absolute maximum values represent the physical limits of the device. Operating the tube beyond these limits may cause permanent damage or severely degrade its service life.

- **Anode No. 3 (Post-Accelerator) Voltage:** 16,000 V dc
- **Anode No. 2 Voltage:** 8,000 V dc
- **Anode No. 1 (Focusing Electrode) Voltage:** 3,000 V dc
- **Anode Input:** 6 Watts
 - *Calculation:* Anode input is calculated as the product of the Anode No. 2 voltage and the average Anode No. 2 current: $\text{Anode Input (W)} = V_{\text{Anode2}} * I_{\text{Anode2(avg)}}$
- **Grid No. 1 Voltage:**
 - Negative Bias Value: 300 V dc
 - Positive Bias Value: 0 V dc
 - Positive Peak Value: 2 V
- **Peak Heater-Cathode Voltage:**
 - Heater Negative with respect to Cathode: 180 V
 - Heater Positive with respect to Cathode: 180 V
- **Peak Voltage between Anode No. 2 and Any Deflecting Plate:** 1,500 V
- **Ratio of Post-Accelerator Voltage (Anode No. 3) to Anode No. 2 Voltage:** 2.5 maximum

Typical Operating Conditions

The typical operating parameters below represent a standard configuration for the 12ANP25 in oscilloscope service:

- **Anode No. 3 Voltage:** 9,700 V dc
- **Anode No. 2 Voltage:** 6,100 V dc
- **Anode No. 1 Voltage (for Focus):** 1,510 to 2,225 V dc
- **Grid No. 1 Voltage (for Cutoff):** -135 to -202 V dc
 - *Note:* Cutoff is defined as the voltage required for visual extinction of the undeflected, focused spot.
- **Deflection Factors:**
 - Deflecting Plates 1-2 (located nearer the screen): 100 to 150 V dc/Inch
 - Deflecting Plates 3-4: 100 to 150 V dc/Inch
- **Modulation:** 45 V maximum
 - *Note:* Measured in accordance with MIL-E-1 specification at a post-accelerator current (I_{A3}) equal to 25 μA .
- **Line Width "A":** 0.5 mm (measured at $I_{A3} = 25 \mu\text{A}$)
- **Line Width "B":** 0.75 mm (measured at $I_{A3} = 25 \mu\text{A}$)
- **Focus Electrode Current:** -25 to +25 μA
- **Undeflected Spot Position:** Within a 20 mm square centered on the tube face.

Circuit Design Constraints

To maintain proper bias stability and prevent damage from excessive grid or deflection plate currents, the external drive circuitry must adhere to the following maximum resistance limits:

- **Grid No. 1 Circuit Resistance:** 2.0 Megohms maximum.
- **Resistance in Any Deflection Plate Circuit:** 5.0 Megohms maximum.

Technical Summary

The **12ANP25** is a specialized 12-inch electrostatic deflection and focus cathode-ray tube featuring an aluminized screen and post-deflection acceleration. Utilizing the long-persistence orange P25 phosphor, it is optimized for applications requiring prolonged trace visibility, such as low-frequency oscilloscopes or radar indicators. With a robust mechanical design incorporating a B12-37 diheptal base, J1-22 post-accelerator bulb contact, and J1-25 neck contacts, the tube operates with an anode No. 3 voltage up to 16,000 V and provides highly linear deflection with typical deflection factors of 100 to 150 V dc/inch.



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 No. 3 voltage	9700 V	—
Anode No. 2 voltage	6100 V	—
Anode No. 1 focus voltage	1510-2225 V	—
Grid No. 1 cutoff voltage	-135 to -202 V	—
Peak voltage between Anode No. 2 and deflecting plate	1500 V	—
Heater-cathode peak voltage	180 V	—

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