

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
CATHODERAY

12ANP2

Specialized - Cathode Ray electronic tube

Twelve-inch direct-view oscilloscope CRT with electrostatic focusing and deflection, post-deflection acceleration, gray-filter glass, and an aluminized screen. The high-voltage multi-anode system is intended for bright oscillographic and instrumentation traces.

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.

12ANP2 — Electrostatic Deflection and Focus Cathode-Ray Tube

The **12ANP2** is a 12-inch direct-viewed, round glass-type cathode-ray tube designed primarily for oscilloscope applications. It features electrostatic deflection, electrostatic focus, and post-deflection acceleration to achieve high-brightness displays. The tube is equipped with an aluminized screen to maximize light output and prevent phosphor degradation. While the 12ANP series can be supplied with various screen phosphors—such as P7, P14, P19, and P25—the 12ANP2 specifically designates the configuration utilizing the P2 phosphor screen.

Mechanical Construction and Physical Dimensions

The 12ANP2 is constructed with a round glass bulb having a minimum useful screen diameter of 11 inches. The physical envelope has a nominal overall length of $22 \frac{1}{2} \pm \frac{3}{8}$ inches and a neck diameter of $2 \frac{3}{16} \pm \frac{1}{16}$ inches.

Electrical connections to the internal electrodes are distributed across the base, neck, and bulb cone to ensure high-voltage isolation and low interelectrode capacitance:

- **Bulb Contact:** A recessed small cavity cap (J1-22) is located on the bulb cone for the Anode No. 3 (post-accelerator) connection.
- **Neck Contacts:** Five small ball caps (J1-25) are positioned on the neck of the tube. These provide direct connections to the four deflecting plates (D1, D2, D3, D4) and Anode No. 2 (A2).
- **Base:** A B12-37 medium shell diheptal 12-pin base is used at the end of the neck.

The physical alignment of the contacts relative to the internal deflection structure is tightly controlled:

- The J1-22 bulb contact aligns with the D3-D4 trace within ± 10 degrees, and also aligns with Pin No. 11 of the base within ± 10 degrees.
- The neck contact for Anode No. 2 (A2) aligns with the D1-D2 trace within ± 10 degrees.
- The angle between the D1-D2 trace and the D3-D4 trace is maintained at 90 ± 1 degree.

The internal deflection plate geometry is arranged such that deflecting plates 1 and 2 are positioned closer to the screen than plates 3 and 4. Applying a positive voltage to deflecting plate D1 deflects the electron beam approximately away from the A2 neck contact. Similarly, applying a positive voltage to deflecting plate D3 deflects the beam approximately away from the post-accelerator bulb contact (J1-22).

Heater and Electrical Connections

The 12ANP2 utilizes an indirectly heated, unipotential cathode. The heater is designed for AC or DC operation.

Heater Parameter	Value
Nominal Heater Voltage	6.3 V
Nominal Heater Current	$0.6 \pm 10\%$ A

The 14AW basing configuration defines the pin assignments on the B12-37 base, viewed from the bottom:

- **Pin 1:** Heater
- **Pin 2:** Cathode
- **Pin 3:** Grid No. 1 (Control Grid)
- **Pin 4:** Anode No. 1 (Focusing Electrode)
- **Pin 14:** Heater

The remaining active electrodes, including the deflecting plates and high-voltage anodes, are routed through the neck and bulb envelope contacts rather than the base pins to prevent voltage breakdown.

Direct Interelectrode Capacitances

The electrode structure exhibits low direct interelectrode capacitances, which supports high-frequency deflection and stable operation. The approximate capacitances are:

Electrode Relationship	Capacitance
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 ratings represent the limiting values of operation. Exceeding these limits may cause permanent damage to the tube or degrade its performance.

- **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
 - *Note: Anode input is calculated as the product of the Anode No. 2 voltage and the average Anode No. 2 current.*
- **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 to Anode No. 2 Voltage:** 2.5 maximum

Typical Operating Conditions and Performance

Under typical operating conditions, the 12ANP2 is biased to provide a sharp, well-defined spot with high deflection sensitivity. The standard operating parameters are:

- **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: 100 to 150 V dc/inch
 - Deflecting Plates 3-4: 100 to 150 V dc/inch
- **Spot Position (Undeflected):** Within a 20 mm square centered on the tube face.

When operating at a post-accelerator current (I_{A3}) of 25 μ A, the tube exhibits the following performance characteristics:

- **Modulation:** 45 V maximum
- **Line Width "A":** 0.5 mm
- **Line Width "B":** 0.75 mm
- **Focus Electrode Current:** -25 to +25 μ A

Circuit Design Constraints

To ensure stable operation and prevent damage to the internal electrodes, the external circuit 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

These resistance limits prevent the accumulation of electrostatic charges and minimize the effects of stray currents on the focus and deflection characteristics of the tube.

Technical Summary

The **12ANP2** is a high-performance, 12-inch round glass cathode-ray tube designed for precision oscilloscope displays. Utilizing electrostatic focus and deflection, along with post-deflection acceleration, it provides a bright, sharp trace. The tube operates with a 6.3 V, 0.6 A heater and is housed in a B12-37 diheptal base, with critical high-voltage and deflection connections routed through specialized neck and bulb contacts. With an absolute maximum post-accelerator rating of 16,000 V and typical deflection factors of 100 to 150 V dc/inch, the 12ANP2 is optimized for demanding visual display systems requiring high resolution and reliable operation.



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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