

ELECTRONIC TUBE REFERENCE

10ANP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Magnetically focused and deflected P4 cathode-ray display tube with white medium-persistence fluorescence, approximately 50-degree deflection, and typical 9 kV anode operation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / 300 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.
Special-purpose CRT electron-gun/display section.

10ANP4 Cathode Ray Tube

A 10-inch round glass, special-purpose cathode ray tube featuring magnetic deflection, magnetic focus, a spherical-aluminized gray glass faceplate, and a P4 phosphor screen.

Overview

The **10ANP4** is a specialized, 10-inch round glass cathode ray tube designed for applications requiring magnetic deflection and magnetic focus. It features a spherical, gray glass faceplate with an aluminized screen. The "10ANP-" family of tubes is characterized by a narrow 7/8-inch neck diameter, a miniature E9-37 base, and a 6.3-volt, 300 mA heater.

The specific designation **10ANP4** utilizes the **P4** phosphor, which provides a white fluorescence with medium persistence, making it suitable for standard monochrome display and imaging applications. Other variants in the same family are supplied with alternative phosphors (such as P7, P16, P19, and P25) to meet different persistence and spectral requirements.

Optical and Screen Characteristics

The 10ANP4 is constructed with a spherical-aluminized gray glass faceplate. The aluminized backing enhances screen brilliance and prevents ion burn, while the gray glass improves contrast under ambient lighting conditions.

The primary optical characteristics of the 10ANP4 are determined by its P4 phosphor screen:

Parameter	Specification
Fluorescence	White
Phosphorescence	None
Persistence	Medium
Minimum Useful Screen Diameter	9 Inches

Phosphor Family Comparisons

While the 10ANP4 is equipped with the medium-persistence P4 white phosphor, the 10ANP- envelope and electron gun assembly can be configured with other screen phosphors to suit specific application demands:

- **P7:** Blue fluorescence with yellow phosphorescence and long persistence.
- **P16:** Violet fluorescence with extremely short persistence.
- **P19:** Orange fluorescence with orange phosphorescence and long persistence.
- **P25:** Orange fluorescence with orange phosphorescence and long persistence.

Note on Screen Protection: For variants utilizing high-persistence or specialized phosphors like P16, P19, and P25, the screen can be permanently damaged if the electron beam current density is allowed to rise too high. To prevent screen burning, minimum beam current densities must be maintained during operation.

Mechanical Specifications and Basing

The 10ANP4 features a compact physical design relative to its screen size, utilizing a narrow neck and a miniature base to minimize space requirements.

Physical Dimensions

- **Overall Length:** 16 Inches (Maximum)
- **Outer Bulb Diameter:** 10-1/2 ± 1/16 Inches

- **Minimum Useful Screen Diameter:** 9 Inches
- **Neck Diameter:** 7/8 Inch nominal (0.840" +0.056" / -0.030" actual)
- **Deflection Angle (Approximate):** 50 Degrees
- **Reference Line to Anode Cap Distance:** 2-1/4 ± 1/4 Inches
- **Reference Line to Base Distance:** 9-7/16 ± 1/8 Inches
- **Reference Line to Neck Flare Transition:** 2.880 Inches

The reference line of the tube is precisely determined by the point where the leading edge of a JEDEC G-112 reference line gauge (a cylinder measuring 2 inches in length with an inside diameter of 1.500" +0.003" / -0.000") stops along the neck flare.

Basing and Connection Layout

The tube utilizes an **E9-37** miniature base and is wired according to the **9NB** basing diagram. High-voltage anode connection is made via a recessed small cavity cap (**J1-21**) located on the side of the bulb.

Pin Number	Connection
Pin 1	No Connection (NC)
Pin 2	Heater (H)
Pin 3	Grid No. 2 (<u>G2</u>)
Pin 4	No Connection (NC)
Pin 5	Cathode (K)
Pin 6	Grid No. 2 (<u>G2</u>)
Pin 7	No Connection (NC)
Pin 8	Heater (H)
Pin 9	Grid No. 1 (G1)
Bulb Cap	Anode (Recessed Small Cavity Cap J1-21)

Alignment and Handling Precautions

Proper mechanical alignment is critical for correct installation. The plane of the J1-21 anode cap passes halfway between Pin 1 and Pin 9 with an allowable tolerance of ±10 degrees. The cap is positioned on the same side of the envelope as Pins 1 and 9.

When installing the tube, a socket with a center opening must be used to clear the exhaust tubulation. Extreme care must be taken during handling to avoid damaging the exposed tubulation and to prevent bending the miniature base pins.

Electrical Ratings and Operating Conditions

The 10ANP4 operates with an indirectly heated cathode and requires a standard 6.3-volt heater supply.

Heater and Capacitance Data

- **Heater Voltage:** 6.3 Volts
- **Heater Current:** 0.3 Ampere $\pm$ 10% (300 mA)
- **Direct Interelectrode Capacitances (Approximate):**
 - Cathode to All Other Electrodes: 5 pF
 - Grid No. 1 to All Other Electrodes: 6 pF
 - Grid No. 2 to All Other Electrodes: 5 pF

Design Maximum Ratings

These ratings represent the absolute limits within which the tube must be operated to ensure reliability and longevity:

- **Anode Voltage:** 12,000 Volts dc (Maximum)
- **Grid No. 2 Voltage:** 450 Volts dc (Maximum)
- **Grid No. 1 Voltage:**
 - Negative Bias Value: 200 Volts dc (Maximum)
 - Positive Bias Value: 0 Volts dc (Maximum)
 - Positive Peak Value: 0 Volts (Maximum)
- **Peak Heater-Cathode Voltage:**
 - Heater Negative with Respect to Cathode: 180 Volts (Maximum)
 - Heater Positive with Respect to Cathode: 180 Volts (Maximum)

Typical Operating Conditions

Under typical operating conditions, the tube is set up with the following parameters:

- **Anode Voltage:** 9,000 Volts dc
- **Grid No. 2 Voltage:** 250 Volts dc
- **Grid No. 1 Voltage:** -15 to -45 Volts dc (for visual extinction of the undeflected focused spot)
- **Focusing Coil Current (Approximate):** 40 to 60 mA dc
- **Linewidth A:** 0.013 Inch (Maximum)
- **Spot Position (Undeflected):** Within a 1/2-inch radius circle concentric with the center of the tube face (when the tube is shielded)
- **Modulation:** 40 Volts (Maximum)

The focusing coil current is measured at an accelerator (anode) current of 100 μ A, using a JEDEC Focus Coil No. 127 (or equivalent) with its air gap center located 2-1/2 inches from the reference line. Linewidth and modulation values are measured per the MIL-E-1 specification at an anode current of 400 μ A.

Circuit Design and Safety Considerations

Performance and Voltage Limits

The performance of the 10ANP4 is highly dependent on the accelerator (anode) voltage. Both brilliance and image definition decrease as the accelerator voltage is reduced. To maintain acceptable display quality, the accelerator voltage should not be operated below a minimum of 7,000 volts.

To prevent damage to the control grid circuit and maintain bias stability, the Grid No. 1 circuit resistance must not exceed a maximum value of **1.5 Megohms**.

X-Ray Radiation Warning

When operating the 10ANP4, safety precautions regarding ionizing radiation must be observed. X-ray radiation shielding may be necessary to protect personnel from prolonged exposure at close range if the tube is operated at voltages higher than the manufacturer's Maximum Rated Anode Voltage (12,000 Volts dc) or 16,000 volts, whichever is less.

Technical Summary

The **10ANP4** is a **10-inch round glass, special-purpose cathode ray tube** featuring **magnetic deflection and magnetic focus**. It is equipped with a **spherical-aluminized gray glass faceplate** and a **P4 white phosphor screen** that provides medium persistence. Operating with a **6.3 V, 300 mA heater**, the tube utilizes an **E9-37 miniature base** with a **9NB basing configuration** and a **J1-21 recessed small cavity cap** for the high-voltage anode connection.

With a design maximum anode voltage rating of **12,000 Volts dc** and a typical operating anode voltage of **9,000 Volts dc**, the 10ANP4 delivers high-contrast, sharp displays with a maximum linewidth of **0.013 inch** under specified MIL-E-1 test conditions. Designers must ensure that the accelerator voltage is kept above **7,000 Volts** to preserve brilliance and definition, limit the Grid No. 1 circuit resistance to **1.5 Megohms**, and implement adequate X-ray shielding if operating near or above maximum voltage limits.

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

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	6.3 V	—
Heater Current	300 mA	—
Focusing Method	Magnetic text	—
Deflection Method	Magnetic text	—
Deflection Angle	50 deg	Approximate
Phosphor	P4 text	—
Fluorescence	White text	—
Persistence	Medium text	—
Maximum Line Width	0.013 in	—
Maximum Undelected Spot Radius	0.5 in	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Anode Voltage	12000 V	—
Maximum Grid2 Voltage	450 V	—
Maximum Grid1 Negative Bias	200 V	—
Maximum Grid1 Positive Bias	0 V	—
Maximum Heater-Cathode Voltage	180 V	EitherPolarity
Anode Voltage	9000 V	—
Grid2 Voltage	250 V	—
Grid1 Cutoff Voltage Minimum	-45 V	—
Grid1 Cutoff Voltage Maximum	-15 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing Coil Current Minimum	40 mA	Approximate
Focusing Coil Current Maximum	60 mA	Approximate
Maximum Grid1 Circuit Resistance	1.5 Mohm	—

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