

ELECTRONIC TUBE REFERENCE

10ANP16

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Magnetically focused and deflected P16 cathode-ray display tube with violet, extremely short-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
<i>No fixed ratings recorded.</i>
<i>Special-purpose CRT electron-gun/display section.</i>

10ANP16 — Special Purpose Cathode Ray Tube

The **10ANP16** is a special-purpose, 10-inch round glass cathode ray tube (CRT) designed for applications requiring magnetic deflection and magnetic focus. It features a spherical, gray-glass faceplate, an aluminized screen, a 7/8-inch diameter neck, and a miniature base. The "10ANP16" designation specifically utilizes the **P16** phosphor, which provides violet fluorescence with extremely short persistence, making it suitable for specialized high-speed or rapid-decay display systems.

Phosphor Characteristics and Screen Protection

The 10ANP16 is distinguished by its P16 phosphor screen. The screen is aluminized and deposited on a gray, spherical glass faceplate to enhance contrast and brightness. The characteristics of the P16 phosphor, along with other options in the 10ANP series, are detailed below:

Phosphor Type	Fluorescence	Phosphorescence	Persistence
P16	Violet	—	Extremely Short
P4	White	—	Medium
P7	Blue	Yellow	Long
P19	Orange	Orange	Long
P25	Orange	Orange	Long

Due to the physical properties of the P16 phosphor (as well as the P19 and P25 phosphors), the screen is highly susceptible to permanent damage if the electron beam current density is allowed to rise too high. To prevent burning of the phosphor, operation must be restricted to minimum beam current densities.

Mechanical Specifications and Base Connections

The 10ANP16 features a 10-inch round glass bulb with a spherical faceplate. It has a maximum overall length of 16 inches and a minimum useful screen diameter of 9 inches. The neck of the tube has a nominal diameter of 7/8 inch (specifically 0.840 inch with a tolerance of +0.056 / -0.030 inch).

Physical Dimensions and Alignment

- **Bulb Diameter:** 10-1/2 ± 1/16 inches
- **Minimum Useful Screen Diameter:** 9 inches
- **Maximum Overall Length:** 16 inches
- **Deflection Angle (Approximate):** 50 degrees
- **Bulb Contact:** J1-21 recessed small cavity cap
- **Base:** E9-37 miniature base
- **Basing Configuration:** 9NB

The J1-21 anode cap is aligned such that its plane passes halfway between Pin 1 and Pin 9 with an alignment tolerance of ±10 degrees. The cap is located on the same side of the envelope as Pins 1 and 9. The reference line of the tube is determined by the point where the leading edge of a JEDEC G-112 reference line gauge (a cylinder 2 inches long with an internal diameter of 1.500 +0.003 / -0.000 inches) stops.

Pinout Configuration (9NB Basing)

The 9NB base connection scheme, viewed from the bottom of the tube, is as follows:

- **Pin 1:** Grid No. 1
- **Pin 2:** Heater
- **Pin 3:** Grid No. 2
- **Pin 4:** No Connection
- **Pin 5:** Cathode

- **Pin 6:** Grid No. 2
- **Pin 7:** No Connection
- **Pin 8:** Heater
- **Pin 9:** Grid No. 1
- **Anode Cap (J1-21):** Anode

A socket with a center opening must be used to clear the tubulation (which has a maximum diameter of 1/4 inch). Extreme care must be taken when handling the tube to avoid damaging the exposed tubulation and bending the base pins.

Electrical and Interelectrode Capacitance Data

The 10ANP16 operates with an indirectly heated cathode. The heater requires a nominal 6.3 V supply and draws a low current of 300 mA, which is highly efficient for a CRT of this size.

Parameter	Value
Heater Voltage	6.3 V
Heater Current	0.3 $\pm$ 10% A (300 mA nominal)
Cathode to All Other Electrodes Capacitance	5 pF (approx.)
Grid No. 1 to All Other Electrodes Capacitance	6 pF (approx.)
Grid No. 2 to All Other Electrodes Capacitance	5 pF (approx.)

Maximum Ratings (Design Maximum Values)

The operating limits of the 10ANP16 must be strictly observed to prevent premature failure or degradation. The design maximum ratings are:

- **Anode Voltage:** 12,000 Volts dc
- **Grid No. 2 Voltage:** 450 Volts dc
- **Grid No. 1 Voltage:**
 - **Negative Bias Value:** 200 Volts dc
 - **Positive Bias Value:** 0 Volts dc
 - **Positive Peak Value:** 0 Volts dc
- **Peak Heater-Cathode Voltage:**
 - **Heater Negative with Respect to Cathode:** 180 Volts
 - **Heater Positive with Respect to Cathode:** 180 Volts
- **Grid No. 1 Circuit Resistance:** 1.5 Megohms Max.

X-Ray Radiation Warning

When operating the 10ANP16, X-ray radiation shielding may be necessary to protect personnel from prolonged exposure at close range. This precaution is particularly critical if the tube is operated at voltages higher than the manufacturer's maximum rated anode voltage of 12,000 V dc or 16,000 volts, whichever is less (meaning shielding is recommended when approaching or exceeding the 12,000 V dc limit).

Typical Operating Conditions

Under typical operating conditions, the 10ANP16 is set up with the following parameters:

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

Operating Notes and Performance Considerations

1. **Accelerator Voltage Limits:** While the typical anode voltage is 9,000 V dc, the accelerator voltage should generally not be operated below 7,000 V dc. Operating below this threshold results in a significant decrease in both display brilliance and spot definition.
2. **Focusing Coil Specifications:** The typical focusing coil current of 40 to 60 mA dc is measured at an accelerator (anode) current of 100 μ A. This measurement is taken with the center of the air gap of a JEDEC Focus Coil No. 127 (or equivalent) positioned exactly 2-1/2 inches from the reference line, with the tube properly shielded.
3. **Linewidth and Modulation:** The maximum linewidth of 0.013 inch and the maximum modulation voltage of 40 volts are measured in accordance with the MIL-E-1 specification at an anode current of 400 μ A.
4. **Undeflected Spot Position:** When the tube is properly shielded, the center of the undeflected, focused spot will fall within a circle of 1/2-inch radius concentric with the physical center of the tube face.

Technical Summary

The **10ANP16** is a specialized 10-inch round glass cathode ray tube utilizing magnetic deflection (50-degree deflection angle) and magnetic focus. It is equipped with a highly efficient 6.3 V, 300 mA heater, a miniature E9-37 base (9NB basing), and a J1-21 anode contact. Its defining feature is the **P16** aluminized screen, which provides violet fluorescence with extremely short persistence, making it ideal for rapid-decay display applications.

To ensure reliable operation, designers must adhere to the 12,000 V dc maximum anode rating, maintain accelerator voltage above 7,000 V dc to preserve brilliance and definition, and limit beam current density

to prevent burning the sensitive P16 phosphor. Proper mechanical support, including a socket with a center opening to clear the tubulation, and adequate X-ray shielding at high operating voltages are required.

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	P16 text	—
Fluorescence	Violet text	—
Persistence	Extremely Short 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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