

Sixteen-inch P4 high-voltage picture tube documented by RCA for direct-view display. Published operating information includes anode voltage around 16 kV and adjustable focusing, characteristic of monochrome television picture-tube service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / 600 A	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Cathode Ray
No fixed ratings recorded.
Source-derived section; promoted fields populated where applicable.

16AYP4 — Electrostatic-Focus Picture Tube

Overview

The **16AYP4** is a rectangular glass picture tube designed for television receivers. It features low-voltage electrostatic focusing, a wide 114° magnetic deflection angle, and an aluminized screen. The tube incorporates a very short electron gun designed to minimize deflection distortion and operate without an ion-trap magnet. It has a 1⅛-inch neck diameter, a minimum projected screen area of 125 square inches, and an external conductive coating.

Construction and Mechanical Characteristics

The 16AYP4 is constructed with a rectangular glass envelope featuring nearly straight sides and slightly rounded corners. The faceplate is made of filterglass with an approximate light transmission of 78% at the center. The screen uses a P4-sulfide type aluminized phosphor.

Physical Dimensions and Mounting

The physical dimensions of the tube are highly compact relative to its screen size, featuring a maximum overall length of 10.25 ± 0.25 inches.

Dimension Parameter	Value
Overall Length	10.25 ± 0.25 inches
Neck Length	4.12 ± 0.12 inches
Nominal Diagonal	15.62 ± 0.12 inches
Greatest Width	13.70 ± 0.12 inches
Greatest Height	11.10 ± 0.12 inches
Approximate Weight	8.5 lbs

The minimum projected screen dimensions are:

- **Diagonal:** 14.875 inches
- **Greatest Width:** 12.938 inches
- **Greatest Height:** 10.250 inches
- **Minimum Area:** 125 square inches

A bulge at the splice-line seal may increase the envelope's maximum width, diagonal, and height by up to 1/8 inch. At any specific point around the seal, this bulge does not protrude more than 1/16 inch beyond the envelope surface.

Electrical Connections and Basing

The tube utilizes a **Small-Button Neoeightar 7-Pin** base (JEDEC No. B7-208, Arrangement 1) with an **8HR** basing designation. The high-voltage anode connection is made via a **Recessed Small Cavity** cap (JEDEC No. J1-21).

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

- **Pin 1:** Heater
- **Pin 2:** Grid No. 1
- **Pin 3:** Grid No. 2
- **Pin 4:** Grid No. 4 (Focusing Electrode)
- **Pin 6:** Grid No. 1

- **Pin 7:** Cathode
- **Pin 8:** Heater
- **Cap:** Anode (Grid No. 3, Grid No. 5, Screen, Collectors)
- **C:** External Conductive Coating

The socket for this base must not be rigidly mounted; it should have flexible leads and be allowed to move freely. The bottom circumference of the base wafer falls within a 1-3/4 inch diameter circle concentric with the bulb axis. The plane through the tube axis and Pin 4 may vary from the plane through the tube axis and the anode terminal by an angular tolerance of $\pm 30^\circ$, with the anode terminal located on the same side as Pin 4.

Heater and Electrical Ratings

The 16AYP4 has an indirectly heated cathode with specific heater characteristics and strict design-maximum limits.

Heater Characteristics

The nominal heater voltage is 6.3 V. Under standard conditions, the heater current is $450 \pm 20 \text{ mA}$. The average heater warm-up time is 11 seconds. This warm-up time is defined as the time required in a specified test circuit (using a 31.5-ohm series resistor and a heater supply of 25.2 V RMS or DC) for the voltage across the heater terminals to rise from zero to 5.0 V.

Design-Maximum Ratings

All voltage values are positive with respect to Grid No. 1, unless otherwise specified.

Parameter	Minimum	Maximum
Anode Voltage	12,000 V	20,000 V
Grid No. 4 (Focusing) Voltage (Positive)	—	1,100 V
Grid No. 4 (Focusing) Voltage (Negative)	—	550 V
Grid No. 2 Voltage	200 V	550 V
Cathode Voltage (Negative peak value)	—	2 V
Cathode Voltage (Negative bias value)	—	0 V
Cathode Voltage (Positive bias value)	—	155 V

Parameter	Minimum	Maximum
Cathode Voltage (Positive peak value)	—	220 V
Heater Voltage	5.7 V	6.9 V

Peak Heater-Cathode Voltage Limits

- **Heater negative with respect to cathode:**
 - During equipment warm-up (not exceeding 15 seconds): 450 V max
 - After equipment warm-up: 300 V max
- **Heater positive with respect to cathode:**
 - Combined AC and DC voltage: 200 V max
 - DC component: 100 V max

Capacitances

- **Cathode to all other electrodes:** 5 pF
- **Grid No. 1 to all other electrodes:** 6 pF
- **External conductive coating to anode:** 800 pF minimum, 1300 pF maximum

Typical Operating Conditions (Cathode-Drive Service)

In cathode-drive service, the video signal varies the cathode potential with respect to Grid No. 1 and the other electrodes. Under typical operating conditions, the voltages are defined as positive with respect to Grid No. 1:

- **Anode Voltage:** 16,000 V
- **Grid No. 4 Voltage:** 100 V (The voltage required for optimum focus on any individual tube can range from -100 V to +300 V)
- **Grid No. 2 Voltage:** 300 V
- **Grid No. 1 Voltage for visual extinction of focused raster:** 28 V to 60 V
- **Maximum Grid No. 1 Circuit Resistance:** 1.5 M Ω

Operating Considerations and Adjustments

X-Radiation Protection

When operated at anode voltages up to 16,000 V, the 16AYP4 does not produce harmful X-radiation. However, because its design-maximum rating allows operation up to 20,000 V, shielding may be required to prevent injury from prolonged close-range exposure if the operating voltage exceeds 16,000 V.

Beam Centering and Magnetic Compensation

To compensate for mechanical tolerances that affect the location of the undeflected, focused spot relative to the center of the screen, an adjustable permanent-magnet (PM) centering magnet is required.

- The distance of the centering magnet from the Reference Line must not exceed 2-1/4 inches.
- The field strength of the centering magnet required ranges from 0 to 8 gauss.
- The maximum field strength of the adjustable centering magnet is calculated as:

$$\text{Maximum Field Strength (gauss)} = \frac{\text{Anode Voltage (volts)}}{16,000 \text{ V}} \times 8 \text{ gauss}$$

Additional compensation for the earth's magnetic field and extraneous magnetic fields must be provided by the equipment manufacturer, preferably integrated into the magnetic field of the deflecting yoke.

Handling and Maintenance

The external conductive coating of the tube must be grounded. The tube features a transparent insulating coating in certain areas; to clean this area, it must be wiped only with a soft, dry, lintless cloth.

Related Designations

The **16BDP4** is identical to the **16AYP4** in all physical and electrical characteristics, except for its heater current rating. The 16BDP4 has a heater current rating of $600 \pm 30 \text{ mA}$ at 6.3 V, compared to the $450 \pm 20 \text{ mA}$ rating of the 16AYP4.

Technical Summary

The **16AYP4** is a rectangular glass picture tube utilizing low-voltage electrostatic focus and 114° magnetic deflection. It features an aluminized screen with a P4-sulfide phosphor, a filterglass faceplate with 78% light transmission, and a short electron gun requiring no ion-trap magnet. Deflection angles are approximately 114° diagonal, 102° horizontal, and 85° vertical. Operating with a nominal 6.3 V, 450 mA heater, the tube is rated for a maximum anode voltage of 20,000 V. It is designed for cathode-drive service, requiring an external centering magnet and proper grounding of its external conductive coating. The **16BDP4** is a related type with identical characteristics except for a higher heater current rating of 600 mA.

SOURCE OPERATING CONDITIONS
[SOURCE PDF](#)

1940 RCA

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

1940 RCA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
t	30 mA	t 30 ma.
ϕ	12.938	ϕ 114° magnetic deflection Greatest wiQth. e e e e e e e e e 12.938°
®	-208	® -1/8-inch diameter neck Arrangement 1, (JEOEC No.B7-208)
Diagonal, » . +	11	Diagonal, » . + 4 & « « « = v v e et e e . 11u° Collectors
Cathode to all other electrodes	5 pF	Cathode to all other electrodes . . 5 pf
Grid No	6 pF	Grid No.1 to all pther electrodes . 6 pf
Ex%grgfildgonduct ve coating	1300 pF	Ex%grgfildgonduct ve coating 1300 max. pf Maximum and Minimum Ratings, Design—Naximum Values:?
800 min. pf Onless otherwise specified, voltage values	800 pF	800 min. pf Onless otherwise specified, voltage values
Heater Current at	20 V	Heater Current at 6.3 volts . . , . 450 % 20 ma are positive with respect to grid No.l
Heater warm-Up Time (Average)	20000 V	Heater warm-Up Time (Average). . . 11 seconds ANODE VOLTAGE {20000 max. volts
inthetest circuit shown in Fig	12000 V	inthetest circuit shown in Fig.1 for the voltage {E} 12000 min. volts
5 volts, Positive valug « + + « « « & » « « 1100 max. volts	1100 V	5 volts, Positive valug « + + « « « & » « « 1100 max. volts
Electyron Gun. . . . Type Requiring No lon-Trap Magnet Negative value . . . + v ϕ« « « 550 « =« «	550 V	Electyron Gun. . . . Type Requiring No lon-Trap Magnet Negative value . . . + v ϕ« « « 550 max. volts

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
published data, and should not be exceeded under the GRID-No	4 V	published data, and should not be exceeded under the GRID-No.4 -TO—GRID—No.) VOLTS ADJUSTED FOR FOCUS.
GRID~N0	2 V	GRID~N0.2-TO-GRID—No.1 VOLTS
4 The grid-Noc.4 voltage required for optimum focus of	4	4 The grid-Noc.4 voltage required for optimum focus of
-100 and +300 volts,	300 V	-100 and +300 volts,
magnet should not exceed	4	magnet should not exceed 2-1/4 inches. The specified in Cathode-Drive Service.
16000 volts	16000 V	16000 volts
{NQTE	3	{NQTE 3) ALL DIMENSIONS (N INCHES
AX1S) OF	9	AX1S) OF +30°9. ANODE TERMINAL S ON SAME SIDE AS
IN INCHES	11968	IN INCHES - 11968

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