



ELECTRONIC TUBE REFERENCE

12BNP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Cathode-ray display tube documented by manufacturer data for type 12BNP4; available extracted source information is sparse, so no more specialized application or construction claim is made.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	6.3 V / 450 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	16000 V
<i>Published Westinghouse ratings, characteristics, capacitances, pulse/deflection data, and typical operating conditions promoted where applicable; additional values retained as parameters.</i>	

12BNP4 — Television Picture Tube

The **12BNP4** is a 12-inch class cathode-ray tube designed for television receiver applications. It features a rectangular screen with a spherical gray filter glass faceplate, low-voltage electrostatic focusing, and 110-degree magnetic deflection. The tube incorporates a banded implosion protection system and does not require an ion trap.

Mechanical Design and Basing

The 12BNP4 is constructed with a short neck to minimize overall cabinet depth. The screen utilizes an aluminized P4 phosphor, providing a high-brightness monochrome display with a light transmittance of approximately 48% at the center.

Physical Dimensions

- **Over-all Length:** 9.348" $\pm$ 0.250"
- **Neck Length:** 4.375" $\pm$ 0.125"
- **Neck Diameter (at splice):** 1.168" maximum
- **Greatest Dimensions:**
 - Diagonal: 12.425" $\pm$ 0.100"
 - Width: 10.987" $\pm$ 0.100"
 - Height: 8.589" $\pm$ 0.100"
- **Minimum Useful Screen Dimensions (Projected):**
 - Diagonal: 11.625"
 - Horizontal Axis: 10.125"
 - Vertical Axis: 7.625"
 - Area: 74 square inches
- **Net Weight:** 6 pounds

Basing and Installation

The tube uses a Small Button 7-Pin base (JEDEC No. B7-208) with an 8HR basing configuration. The high-voltage anode connection is made via a J1-21 bulb contact.

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
- **Bulb Contact:** Anode (Grids No. 3 and No. 5)

To prevent damage and ensure proper operation, several mechanical installation requirements must be met:

- **Yoke Alignment:** The yoke reference line is determined by the plane surface of the flared end of a JEDEC Reference Line Gauge No. 126 when seated on the funnel of the tube.
- **Base Pin Strain:** Lateral strains on the base pins must be avoided. The socket must have flexible leads that permit movement, and the perimeter of the base wafer must fit inside a 1.750-inch diameter circle concentric with the tube axis. Base pin 2 aligns with the major axis within 30 degrees and is on the same side as the anode terminal.
- **Grounding:** Both the external conductive coating and the tension band must be grounded. The external conductive coating forms a supplementary filter capacitance.
- **Cleaning:** The tube features a transparent, insulating coating 3 inches in diameter, which must be cleaned only with a soft, dry, lintless cloth.

Electrical Characteristics and Ratings

The 12BNP4 operates with a nominal 6.3-volt heater. The heater-cathode circuit is designed to withstand significant voltage differentials during and after warm-up.

Heater and Capacitance Data

- **Heater Voltage:** 6.3 V
- **Heater Current:** $450 \pm 5\%$ mA
- **Heater Warm-up Time:** 11 seconds (defined as the time required for the voltage across the heater to reach 80% of its rated value after applying 4 times the rated heater voltage to a circuit consisting of the heater in series with a resistance equal to 3 times the rated heater voltage divided by the rated heater current)
- **Direct Interelectrode Capacitances:**
 - Cathode to all other electrodes: 5 pF (approximate)
 - Grid No. 1 to all other electrodes: 6 pF (approximate)
 - External conductive coating to anode: 500 pF minimum, 750 pF maximum
- **Insulation Resistance:** Minimum of 5 Megohms between the external conductive coating and the implosion protection hardware.

Design Maximum Ratings

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

- **Maximum Anode Voltage:** 16,000 V
- **Minimum Anode Voltage:** 9,000 V
- **Grid No. 4 (Focusing Electrode) Voltage:** +1100 V to -550 V
- **Maximum Grid No. 2 Voltage:** 400 V
- **Minimum Grid No. 2 Voltage:** 200 V
- **Grid No. 1 Voltage:**
 - Maximum Negative Bias Value: 154 V
 - Maximum Negative Peak Value: 220 V
 - Maximum Positive Bias Value: 0 V
 - Maximum Positive Peak Value: 2 V
- **Heater Voltage Limits:** 5.67 V minimum to 6.93 V maximum
- **Maximum Heater-Cathode Voltage:**
 - Heater negative with respect to cathode (during warm-up, ≤ 15 seconds): 450 V
 - Heater negative with respect to cathode (after warm-up): 200 V
 - Heater positive with respect to cathode: 200 V

Limiting Circuit Values

- **Maximum Grid No. 1 Circuit Resistance:** 1.5 Megohms

- **Minimum Grid No. 2 and Grid No. 4 Circuit Resistance:** 10,000 Ohms (protective resistance is advisable in these circuits to prevent damage)

Typical Cathode Drive Operation

Under typical operating conditions, the 12BNP4 is driven via the cathode. All voltages listed are positive with respect to Grid No. 1:

- **Anode Voltage:** 12,000 V
- **Grid No. 4 (Focusing Electrode) Voltage:** 0 to 400 V
- **Grid No. 2 Voltage:** 250 V
- **Cathode Voltage for Raster Cutoff:** 35 to 65 V

In typical operation, with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to give an anode current of 150 microamperes on a 10.125" by 7.625" pattern (from a type [2F21](#) monoscope or equivalent), individual tubes will achieve satisfactory focus at a specific voltage between 0 and 400 volts on Grid No. 4.

Technical Summary

The **12BNP4** is a compact, 110-degree magnetic deflection television picture tube utilizing low-voltage electrostatic focusing and a cathode-drive configuration. Operating with a 6.3 V, 450 mA heater, it provides a 74-square-inch useful screen area on an aluminized P4 phosphor. Its mechanical design features a banded implosion protection system, a grounded external conductive coating that acts as a filter capacitor, and a short 4.375-inch neck. By adhering to the design maximum ratings—including an anode voltage limit of 16,000 V and protective series resistance in the Grid 2 and Grid 4 circuits—the tube delivers reliable performance in compact monochrome television displays.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Westinghouse Data Book

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

1965 WESTINGHOUSE DATA BOOK

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	Low-voltage electrostatic	—
Deflection method	Magnetic	—
Horizontal deflection angle	99 deg	—
Vertical deflection angle	80 deg	—
Diagonal deflection angle	110 deg	—
Heater warm-up time	11 s	—
Light transmission	48 %	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Anode voltage maximum	16000 V	—
Anode voltage minimum	9000 V	—
Focus-electrode voltage minimum	-550 V	—
Focus-electrode voltage maximum	1100 V	—
Grid2 voltage minimum	200 V	—
Grid2 voltage maximum	400 V	—
Heater voltage minimum	5.67 V	—
Heater voltage maximum	6.93 V	—
Heater-cathode voltage during warmup maximum	450 V	—
Heater-cathode voltage after warmup maximum	200 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-to-all capacitance	5 pF	—
Grid1-to-all capacitance	6 pF	—
External coating capacitance minimum	500 pF	—
External coating capacitance maximum	750 pF	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Monochrome television picture display	—

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