

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

16BNP4

1 SECTION
CONSTRUCTION
CATHODERAY

Specialized - Cathode Ray electronic tube

Sixteen-inch P4 direct-view picture tube documented by National Video. Its anode operates over roughly 12-18 kV, typically about 15 kV, with an external conductive coating serving the high-voltage display structure.

GENERAL CHARACTERISTICS

BASE DESIGNATION	B7-208	BASE PINS	—
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.
CRT maximum anode voltage 18000 V; CRT-specific electrode ratings retained in parameter table.

16BNP4 — Electrostatic Focus Cathode Ray Tube

The **16BNP4** is a 16-inch, heavyweight cathode ray tube (CRT) featuring a 114-degree diagonal deflection angle and a short 4 3/8-inch neck length. Designed by the National Video Corporation, this tube is engineered for television display applications utilizing a cathode-drive configuration. It features an electrostatic focusing system, a straight electron gun that does not require an external ion trap magnet, and a low-voltage Grid No. 2 design.

Mechanical and Optical Specifications

The 16BNP4 is constructed with a glass bulb designated as J125-C1 (or equivalent). The physical dimensions of the tube are tightly controlled, with key measurements specified at the mold-match line:

- **Overall Length:** 10 1/2 inches (with a tolerance of +5/16 inch)
- **Neck Length:** 4 3/8 inches (with a tolerance of $\pm 1/8$ inch)
- **Greatest Diagonal Dimension:** 15 5/8 inches (with a tolerance of $\pm 1/8$ inch)
- **Greatest Width:** 13 23/32 inches (with a tolerance of $\pm 1/8$ inch)
- **Greatest Height:** 11 3/32 inches (with a tolerance of $\pm 1/8$ inch)

Screen and Optical Characteristics

The tube features an aluminized JEDEC P4 phosphor screen, which provides a minimum useful projected screen area of 125 square inches. The minimum useful projected screen dimensions are:

- **Diagonal:** 14 7/8 inches
- **Horizontal Axis:** 12 15/16 inches
- **Vertical Axis:** 10 1/4 inches

The light transmittance at the center of the screen is approximately 78 percent.

Deflection and Alignment

The tube is designed for wide-angle magnetic deflection, with approximate deflection angles as follows:

- **Horizontal:** 103 degrees
- **Vertical:** 87 degrees
- **Diagonal:** 114 degrees

The high-voltage anode connection is made via a JEDEC J1-21 recessed small cavity cap (ultor terminal), which connects internally to Grid No. 3, Grid No. 5, and the collector. This terminal is located on the same side of the bulb as Pin No. 4, with an angular alignment tolerance of ± 30 degrees relative to the plane passing through the tube axis and Pin No. 4.

Electrical Ratings and Operating Conditions

The electrical ratings for the 16BNP4 are established under the Design Maximum System. Unless otherwise specified, all voltage values are positive and measured with respect to Grid No. 1.

Design Maximum Ratings

- **Anode Voltage:** 18,000 Volts maximum, 12,000 Volts minimum
- **Grid No. 4 (Focusing Electrode) Voltage:** -500 to +1100 Volts
- **Grid No. 2 Voltage:** 25 Volts minimum, 60 Volts maximum
- **Cathode Voltage:**
 - *DC Positive Value:* 100 Volts maximum

- *Peak Positive Value:* 150 Volts maximum
- *DC Negative Value:* 0 Volts maximum
- *Peak Negative Value:* 2 Volts maximum
- **Heater Voltage:** 5.8 Volts minimum, 6.9 Volts maximum
- **Heater-Cathode Voltage:**
 - *Heater negative with respect to cathode (during warm-up, ≤ 15 seconds):* 450 Volts maximum
 - *Heater negative with respect to cathode (after warm-up):* 200 Volts maximum
 - *Heater positive with respect to cathode:* 200 Volts maximum

Typical Operating Conditions (Cathode Drive Service)

In typical cathode-drive applications, the operating voltages are referenced to Grid No. 1:

- **Anode Voltage:** 15,000 Volts DC
- **Grid No. 4 Voltage:** 250 Volts DC (individual tubes will achieve satisfactory focus at some value between 0 and 400 Volts DC)
- **Grid No. 2 Voltage:** 50 Volts DC
- **Cathode Voltage (for visual extinction of focused raster):** 35 to 55 Volts DC

These typical operating conditions are specified with the combined Grid No. 1 bias voltage and video-signal voltage adjusted to produce an anode current of 100 microamperes on a 12 15/16" x 10 1/4" pattern (such as that from an RCA [2F21](#) Monoscope or equivalent).

Direct Interelectrode Capacitances

- **Cathode to all other electrodes:** approximately 5 pF
- **Grid No. 1 to all other electrodes:** approximately 6 pF
- **External conductive coating to anode:** 1000 pF minimum, 1500 pF maximum

Pinout, Basing, and Installation Requirements

The 16BNP4 utilizes a JEDEC 8HR base with a B7-208 basing arrangement. The pin connections, viewed from the bottom of the tube base, are as follows:

Pin Number	Connection
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 Number	Connection
Pin 8	Heater
Cap	Ultor (Grid No. 3, Grid No. 5, Collector)
C	External Conductive Coating

Installation and Handling Guidelines

- **Socket Mounting:** The socket for the 8HR base must not be rigidly mounted. It should be connected via flexible leads and allowed to move freely to prevent the circuit wiring from exerting lateral strain on the base pins. The bottom circumference of the base wafer is designed to fit within a 1 3/4-inch diameter circle concentric with the bulb axis.
- **Reference Line:** The reference line is determined using a JEDEC No. G-126 reference-line gauge. When the tube neck is inserted through the flared end of the gauge and seated, the reference line is defined by the intersection of Plane CC' of the gauge with the glass funnel.
- **Grounding:** The external conductive coating must be grounded to ensure proper operation and safety.
- **Cleaning:** The area of the external conductive coating and transparent insulating coating should be cleaned only by wiping with a soft, dry, lint-free cloth.
- **Grid No. 1 Circuit Resistance:** The maximum allowable resistance in the Grid No. 1 circuit is 1.5 Megohms.
- **Heater Characteristics:** The heater operates at a nominal voltage of 6.3 Volts with a current of 600 $\pm$ 30 mA. The heater has a controlled warm-up time of 11 seconds.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1956 National Video

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

1956 NATIONAL VIDEO

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
The [1]	16	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
The [2]	16	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
The [3]	-1149	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
The [4]	4	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
The [5]	3	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
The [6]	8	The 16BNP4 is a 16"-1149 heavyweight cathode ray tube with a 4 3/8"
straight gun which requires no ion trap, and	50 V	straight gun which requires no ion trap, and 50 volt G2 for cathode
Grid # [1]	1 pF	Grid #1 to all other electrodes, approximate 5 uuf
Grid # [2]	5 pF	Grid #1 to all other electrodes, approximate 5 uuf
External Conductive Coating to Anode	1500 pF	External Conductive Coating to Anode 1500 Max. uuf
Heater Current at [1]	6.3 V	Heater Current at 6.3 Volts 600 + 30 Ma
Heater Current at [2]	600 V	Heater Current at 6.3 Volts 600 + 30 Ma
Heater Current at [3]	30 V	Heater Current at 6.3 Volts 600 + 30 Ma
Heater Warm-up Time	11	Heater Warm-up Time 11 Seconds
Light Transmittance at Center, Approximate	78	Light Transmittance at Center, Approximate 78 Percent

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
and measured with respect to Grid #	1	and measured with respect to Grid #1.
Maximum Anode Voltage	18000 V	Maximum Anode Voltage 18,000 Volts
Minimum Anode Voltage	12000 V	Minimum Anode Voltage 12,000 Volts
Maximum Grid # [1]	4 V	Maximum Grid #4 (Focusing Electrode) Voltage +1100 -500
Maximum Grid # [2]	1100 V	Maximum Grid #4 (Focusing Electrode) Voltage +1100 -500
Maximum Grid # [3]	-500 V	Maximum Grid #4 (Focusing Electrode) Voltage +1100 -500
Maximum Grid # [1]	2 V	Maximum Grid #2 Voltage 60 Volts
Maximum Grid # [2]	60 V	Maximum Grid #2 Voltage 60 Volts
Minimum Grid # [1]	2 V	Minimum Grid #2 Voltage 25 Volts
Minimum Grid # [2]	25 V	Minimum Grid #2 Voltage 25 Volts
Maximum Heater Voltage	6.9 V	Maximum Heater Voltage 6.9 Volts
Minimum Heater Voltage	5.8 V	Minimum Heater Voltage 5.8 Volts
During warm-up period not to exceed [1]	15 V	During warm-up period not to exceed 15 seconds 450 Volts
During warm-up period not to exceed [2]	450 V	During warm-up period not to exceed 15 seconds 450 Volts
After equipment warm-up period	200 V	After equipment warm-up period 200 Volts
Heater positive with respect to cathode	200 V	Heater positive with respect to cathode 200 Volts
positive with respect to Grid #	1	positive with respect to Grid #1,
Anode Voltage	15000 V	Anode Voltage 15,000 Volts DC
Grid #	4 V	Grid #4 Voltage (Focusing Electrode)
Grid # [1]	2 V	Grid #2 Voltage 50 Volts DC
Grid # [2]	50 V	Grid #2 Voltage 50 Volts DC
Cathode Voltage (Note [1])	1 V	Cathode Voltage (Note 1) 35 to 55 Volts DC
Cathode Voltage (Note [2])	35 V	Cathode Voltage (Note 1) 35 to 55 Volts DC
Cathode Voltage (Note [3])	55 V	Cathode Voltage (Note 1) 35 to 55 Volts DC
Maximum Grid # [1]	1	Maximum Grid #1 Circuit Resistance 1.5 Megohms

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Grid # [2]	1.5	Maximum Grid #1 Circuit Resistance 1.5 Megohms
Pin [1]	1	Pin 1 Heater Pin 6 Grid No, 1
Pin [2]	6	Pin 1 Heater Pin 6 Grid No, 1
Pin [3]	1	Pin 1 Heater Pin 6 Grid No, 1
Pin [1]	2	Pin 2 Grid No. 1 Pin 7 Cathode
Pin [2]	1	Pin 2 Grid No. 1 Pin 7 Cathode
Pin [3]	7	Pin 2 Grid No. 1 Pin 7 Cathode
Pin [1]	3	Pin 3 Grid No. 2 Pin 8 Heater
Pin [2]	2	Pin 3 Grid No. 2 Pin 8 Heater
Pin [3]	8	Pin 3 Grid No. 2 Pin 8 Heater
Published value	20	20 ® IPINSGRIDNO.I (NOTE5
Published value	1	1. Visual extinction of focused raster,
Published value [1]	2 V	2. With the combined grid #1 bias voltage and video-signal voltage
Published value [2]	1 V	2. With the combined grid #1 bias voltage and video-signal voltage
adjusted to give an anode current of	100	adjusted to give an anode current of 100 microanmperes on a
Published value	3	3. Individual tubes will have satisfactory focus at some value