

ELECTRONIC TUBE REFERENCE

10UP21

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Ten-inch cathode-ray display tube using electrostatic focusing and magnetic deflection. Its aluminized P21 screen gives orange fluorescence with long persistence, emphasizing sustained visual presentation rather than ordinary short-persistence television imagery.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	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.
Cathode-ray display/electron-gun section.

10UP21 Cathode-Ray Tube

An electrostatic-focus, magnetic-deflection cathode-ray tube designed for high-resolution applications, featuring a 10-inch screen, a metal-backed screen with a gray filter face plate, and a long-persistence orange phosphor.

Overview

The **10UP21** is a 10-inch cathode-ray tube utilizing electrostatic focus and magnetic deflection. It is designed for specialized applications where high resolution is the primary requirement. The 10UP21 is similar in design to the Type 10KP- but incorporates an electrostatic focus lens system that delivers significantly improved resolution. This focus lens is engineered to operate at or near cathode potential,

providing substantially automatic focus that remains independent of variations in the accelerator voltage. To enhance contrast and brightness, the tube utilizes a gray filter face plate in combination with a metal-backed screen.

Optical and Electrical Characteristics

The 10UP21 utilizes electrostatic focusing and magnetic deflection, with an approximate deflecting angle of 50 degrees. The screen is equipped with Phosphor No. 21, which exhibits orange fluorescence, orange phosphorescence, and long persistence.

The electrical characteristics of the heater and the direct interelectrode capacitances are as follows:

- **Heater Voltage:** 6.3 V
- **Heater Current:** $0.6 \pm 10\%$ A
- **Cathode to all other electrodes capacitance:** Approximately 5 μF
- **Grid No. 1 to all other electrodes capacitance:** Approximately 6.5 μF

Mechanical Design and Basing Configuration

The physical structure of the 10UP21 is defined by specific mechanical tolerances to ensure precise alignment in high-resolution equipment:

- **Overall Length:** $17 \frac{5}{8} \pm \frac{3}{8}$ inches
- **Greatest Diameter of Bulb:** $10 \frac{1}{2} \pm \frac{1}{8}$ inches
- **Minimum Useful Screen Diameter:** 9 inches
- **Neck Outer Diameter (O.D.):** $1 \frac{7}{16} + \frac{1}{32} - \frac{1}{16}$ inches (within the specified neck space)
- **Bulb Contact:** Recessed small cavity cap (J1-21)
- **Base:** Small shell duodecal 6-pin (B6-63)
- **Basing Designation:** 12M

The J1-21 bulb contact aligns with the vacant pin position No. 3 within a tolerance of ± 10 degrees.

The 12M basing arrangement provides the following electrical connections, viewed from the bottom of the base:

Pin Number	Element
1	Heater
2	Grid No. 1
6	Focusing Electrode
10	Grid No. 2
11	Cathode
12	Heater

Pin Number	Element
Cap	Accelerator (J1-21)

Maximum Ratings and Typical Operating Conditions

The maximum ratings are established under the Design Center system. Operating the tube beyond these limits may compromise performance or longevity.

Maximum Ratings (Design Center Values)

- **Accelerator Voltage:** 12,000 Max. Volts D-C
- **Focusing Electrode Voltage:** -500 to +1000 Max. Volts D-C
- **Grid No. 2 Voltage:** 700 Max. Volts D-C
- **Grid No. 1 Negative Bias Value:** 180 Max. Volts D-C
- **Grid No. 1 Positive Bias Value:** 0 Max. Volts D-C
- **Grid No. 1 Positive Peak Value:** 2 Max. Volts
- **Peak Heater-Cathode Voltage (Heater Negative):** 180 Max. Volts D-C
- **Peak Heater-Cathode Voltage (Heater Positive):** 180 Max. Volts D-C

Typical Operating Conditions

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

- **Accelerator Voltage:** 10,000 Volts D-C. At or near this rating, the effective resistance of the accelerator supply must be sufficient to limit the accelerator input power to 6 watts. Brilliance and definition decrease as accelerator voltage is reduced; it is generally recommended that this voltage not fall below 7,000 volts.
- **Focusing Electrode Voltage:** 0 to +200 Volts D-C. This is measured with the Grid No. 1 voltage adjusted to produce an accelerator current of 50 μ A, with the pattern adjusted for the best overall focus. The measurement is conducted using a 525-line interlaced and synchronized 6x8-inch pattern with interlaced line blanking.
- **Focusing Electrode Current:** -15 to +25 μ A D-C.
- **Grid No. 2 Voltage:** 300 Volts D-C.
- **Grid No. 1 Voltage:** -28 to -72 Volts D-C, representing the range for visual extinction of a focused 6x8-inch pattern.
- **Maximum Line Width:** 0.013 inch. This is measured using a 525-line interlaced and synchronized pattern with interlaced line blanking, where the pattern width is adjusted to 90% of the minimum useful screen diameter, and the beam current (I_b) is 25 μ A. The line width is calculated as the merged raster width divided by the number of active lines (262.5).
- **Undelected Spot Position:** The center of the undeflected, focused spot will fall within a circle of 1/2-inch radius concentric with the center of the tube face.
- **Maximum Grid No. 1 Circuit Resistance:** 1.5 Megohms.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

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

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Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	6.3 V	—
Heater Current	600 mA	—
Focusing Method	Electrostatic text	—
Deflection Method	Magnetic text	—
Phosphor	P21 text	—
Fluorescence	Orange text	—
Persistence	Long text	—
Screen Construction	Aluminized/metal-backed text	—