



ELECTRONIC TUBE REFERENCE

10FP4A

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Magnetically focused and deflected white-screen cathode-ray display tube explicitly specified for radar, monitor, and display service, with typical high-voltage operation around 10 kV.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	5
NOMINAL HEATER	6.3 V / 600 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	12000 V
<i>Cathode-ray picture tube; maximum anode voltage mapped to MaxPlateVoltage.</i>	

10FP4A — Cathode Ray Tube

The **10FP4A** (also designated as the **10FP4** or **10FP4-A**) is an all-glass, direct-view cathode ray tube designed primarily for television receivers and television monitoring equipment. It features magnetic deflection and focusing, a semi-flat faceplate, and a high-definition reflective metal-backed (aluminized) screen. The aluminized screen increases light output, improves contrast, and prevents ion-spot blemishes without requiring an external ion-trap magnet. Additionally, the tube features an external conductive coating that serves as a high-voltage filter capacitor when grounded.

Physical and Mechanical Construction

The 10FP4A is constructed with a round glass bulb (ASA bulb number J84C) and a spherical gray faceplate that provides approximately 74% light transmission at its center. The screen utilizes a P4

sulfide-type or Type 'T' silver-activated phosphor, producing white fluorescence and phosphorescence with short to medium persistence.

Dimensions and Weight

- **Overall Length:** $17\text{-}5/8 \pm 3/8$ inches (approximately 446 to 456 mm)
- **Greatest Bulb Diameter:** $10\text{-}1/2 \pm 1/8$ inches (267 ± 3 mm)
- **Minimum Useful Screen Diameter:** $9\text{-}1/8$ inches (232 mm)
- **Neck Diameter:** $1\text{-}7/16 \pm 1/16$ inches (nominal 36.5 to 37 mm)
- **Neck Length:** $8\text{-}1/8$ inches
- **Raster Size:** 6 inches by 8 inches
- **Deflection Angle:** 50 to 54 degrees
- **Net Weight:** Approximately $10\text{-}1/2$ lbs (4.6 kg)

Handling and Safety Precautions

Due to the large evacuated volume, the 10FP4A presents a high risk of implosion and must be handled with extreme care. It should never be held by the neck or base. During operation and handling, a protective transparent screen must be placed in front of the tube. The envelope is designed to withstand a special control pressure test of 3 kg/cm^2 .

To protect the tube from external electromagnetic and electrostatic fields, high magnetic permeability (mu-metal) shielding is recommended. To prevent screen burn, stationary or slow-moving spots must be avoided except at very low beam current densities. Deflection voltages must always be applied before applying Grid 2 and anode voltages.

Heater and Basing Configuration

The 10FP4A is equipped with a coated unipotential cathode. The heater is designed for AC or DC operation. The standard version of the tube operates with a 6.3 V, 0.3 A heater, but a version with a 6.3 V, 0.6 A heater is available to serve as a direct replacement for American-origin tubes.

- **Heater Voltage (V_f):** 6.3 V ($\pm 10\%$ tolerance)
- **Heater Current (I_f):** 0.6 A nominal (ranging from 540 mA to 660 mA at 6.3 V) or 0.3 A depending on the specific version.

Pin Connections

The tube uses a small-shell Duodecal 5-pin base (JETEC No. B5-57, Basing 12N) or a Duodecal 7-pin base (12C27-U.T.E. / B12A). The high-voltage anode connection is made via a recessed small cavity cap (JETEC No. J1-21 / CT8 / C.8.1.U.T.E.) located on the side of the bulb. The anode contact aligns with the Pin 3 position within ± 30 degrees.

The pin configuration, viewed from the underside of the base, is as follows:

Pin Number	Connection
Pin 1	Heater
Pin 2	Grid No. 1
Pin 6	No Connection
Pin 7	No Connection
Pin 10	Grid No. 2 (1st Anode)
Pin 11	Cathode
Pin 12	Heater
Side Cap	Anode (Grid No. 3 / 2nd Anode)

Note: Pins 3, 4, 5, 8, and 9 are omitted ("No Pin") on the 5-pin base configuration.

Electrical Characteristics and Operating Points

The 10FP4A operates with high anode voltages and magnetic focusing. The recommended center of the magnetic length of the focus unit should be positioned approximately 80 mm (or 4-1/2 inches) from the reference line.

Direct Interelectrode Capacitances

- **Grid No. 1 to all other electrodes:** 6 pF to 10 pF (8 pF typical)
- **Cathode to all other electrodes:** 4 pF to 8 pF (5 pF typical)
- **External conductive coating to anode:** 500 pF (minimum) to 2500 pF (maximum)

Typical Operating Conditions

Under typical operating conditions, the tube is set up as follows:

Parameter	Value
Anode Voltage (V_a)	11,000 V DC (10,000 V in some configurations)
Grid No. 2 Voltage ($V_{[g2]}$)(/tubes/G2))	250 V to 300 V DC
Grid No. 1 Voltage (V_{g1}) for visual extinction	-27 V to -63 V DC (or -28 V to -72 V DC)
Focusing Coil Current	~100 mA DC (using RETMA No. 109 coil) to 110 mA DC
Spot Centering / Displacement	16 mm to 18 mm maximum
Line Width (at screen center)	0.5 mm maximum (at $I_a = 100 \mu A$)

At an anode voltage of 11,000 V and Grid 2 voltage of 250 V, the average anode current (I_a) versus Grid 1 voltage (V_{g1}) curve shows that the beam current starts near 0 μA at $V_{g1} \approx -60$ V and rises non-linearly to approximately 1000 μA as V_{g1} approaches -10 V. Brightness and focus decrease below 11,000 V, and the anode voltage should not fall below 8,000 V.

Maximum Ratings and Design Limits

The following absolute maximum and design-center ratings must be observed to ensure reliable operation and prevent damage to the tube:

- **Anode Voltage (V_a):** 12,000 V DC maximum (up to 13,000 V under specific absolute maximum conditions; minimum 7,000 V to 8,000 V)
- **Grid No. 2 Voltage ($V_{[g2]}(/tubes/G2)$):** 410 V DC maximum (up to 450 V under absolute maximum conditions; minimum 150 V)
- **Grid No. 1 Voltage (V_{g1}):**
 - Negative-bias value: 125 V DC maximum (absolute minimum negative value of -180 V)
 - Positive-bias value: 0 V DC maximum
 - Positive-peak value: 2 V maximum
- **Peak Heater-Cathode Voltage (V_{fk}):**
 - Heater negative with respect to cathode (during warm-up ≤ 15 seconds): 410 V maximum
 - Heater negative with respect to cathode (after warm-up): 140 V maximum
 - Heater positive with respect to cathode: 140 V maximum (or ± 125 V under absolute maximum conditions)
- **Grid No. 1 Circuit Resistance (R_{g1}):** 1.5 M Ω maximum
- **Heater-Cathode Resistance (R_{h-k}):** 1.0 M Ω maximum
- **Grid No. 2 (1st Anode) Supply Impedance:** 1.5 M Ω maximum

Equipment Design Limits and Leakage Currents

- **Grid No. 2 Current ($I_{[g2]}(/tubes/G2)$):** 15 μA maximum (at $V_{g1} = 0$ V, $V_{[g2]}(/tubes/G2) = 250$ V, $V_a = 11,000$ V)
- **Modulation Voltage:** 32 V maximum (at $I_a = 100$ μA ; remains 32 V maximum after 500 hours of operation under life test conditions)
- **Heater-Cathode Leakage Current:** 30 μA maximum (at $V_{fk} = \pm 125$ V)
- **Grid No. 1 Leakage Current:** 5 μA maximum (at Grid 1 at cutoff, $V_{[g2]}(/tubes/G2) = 250$ V, $V_a = 11,000$ V)
- **Grid No. 2 Leakage Current:** 15 μA maximum (at Grid 1 at cutoff, $V_{[g2]}(/tubes/G2) = 250$ V, $V_a = 11,000$ V)

Power Supply Requirements

The high-voltage anode supply for the 10FP4A can be designed using a half-wave rectifier or a voltage doubler circuit. Because the current demand of the anode is very low (typically 1 mA maximum), small filter capacitors (such as 0.1 μ F) are sufficient for smoothing. The external conductive coating of the tube, when grounded, acts as an additional filter capacitor (500 to 2500 pF) to assist in E.H.T. smoothing. To ensure safety and protect the tube from high-energy arcs, the internal resistance of the high-tension (HT) source must be high enough to limit the maximum output power to 6 W.

Technical Summary

The **10FP4A** is a 10-inch, magnetically focused and deflected cathode ray tube designed for television receivers and monitoring equipment. It features an aluminized screen with white fluorescence and short-to-medium persistence, a semi-flat gray faceplate, and an external conductive coating that functions as an E.H.T. filter capacitor. Operating typically at an anode voltage of 11,000 V and a Grid 2 voltage of 250 V to 300 V, it provides high-definition imaging with a maximum line width of 0.5 mm at the center. The tube is available with either a standard 0.3 A heater or a 0.6 A heater for direct replacement of American-origin types, housed in a duodecal base configuration.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1958 Compagnie General

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

1958 COMPAGNIE GENERAL

Section 1 · Cathode Ray

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing Method	Electromagnetic	—
Deflection Method	Electromagnetic	—
Aluminized Screen	Yes	—
High Definition Screen	Yes	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #2 Voltage	250 V	TypicalOperating
Focusing Coil Current	110 mA	TypicalOperating
Raster Width	8 in	—
Raster Height	6 in	—
Max Imum Anode Voltage	12000 V	—
Negative BIAs Voltage	25 V	—
Positive Bias Voltage	0 V	—
Positive Peak Voltage	2 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
After Equipment Warm--Up Period	140 V	—
Heater Positive With Respect To Cathode	140 V	—
Anode Voltage	11000 V	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Ferranti

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

1963 FERRANTI

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	Magnetic	—
Deflection method	Magnetic	—
Deflection angle	50 deg	—
Fluorescence	White	—
Persistence	Short	—

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor type	T	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Radar / monitor / display CRT	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
First-anode voltage maximum	410 V	—
Second-anode voltage maximum	12000 V	—
Heater-cathode voltage maximum	200 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
First-anode operating voltage	250 V	—
Second/fourth-anode operating voltage	10000 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode-to-all capacitance maximum	8 pF	—
Grid-to-all capacitance maximum	8 pF	—
External-coating capacitance maximum	2500 pF	—
External-coating capacitance minimum	500 pF	—