

ELECTRONIC TUBE REFERENCE

12LP4A

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Twelve-inch P4 television picture tube with magnetic focusing and deflection, gray filter glass, and an external double-field ion trap. Its white medium-persistence screen operates at roughly 11 kV anode voltage for direct viewing.

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	
MAXIMUM PLATE VOLTAGE	12000 V
Published source values promoted where applicable.	

12LP4A — Magnetic Deflection and Focus Cathode-Ray Tube

The **12LP4A** is a 12-inch round, glass, direct-view cathode-ray tube (CRT) designed primarily for television receiver applications. It features magnetic deflection and magnetic focusing, utilizing an electron gun designed for use with an external double-field ion-trap magnet. A defining characteristic of the 12LP4A is its gray, neutral-density (filter glass) faceplate, which distinguishes it from the clear-glass [12LP4](#) and provides enhanced picture contrast and detail under high ambient light conditions.

Optical and Screen Characteristics

The 12LP4A utilizes a P4 sulfide-type phosphor screen. This phosphor produces a white fluorescence and a white phosphorescence. The persistence of the screen is characterized differently across manufacturer specifications, being designated as "medium" in some documentation and "short" in others.

The faceplate is spherical and constructed of gray filter glass. This gray glass has an approximate light transmission of 66 percent at the center of the screen. By absorbing a portion of both the ambient light entering the tube and the reflected light exiting it, the gray faceplate significantly improves contrast and image detail when operated in brightly lit environments.

The tube provides a picture size of approximately 11 1/4 by 8 1/2 inches with rounded sides. The minimum useful screen diameter is specified as either 11 inches or 11 1/4 inches depending on the manufacturer.

Mechanical Construction and Basing

The 12LP4A is an all-glass tube with a nominal bulb diameter of 12 inches. Its physical dimensions and mechanical features include:

Parameter	Value / Specification
Over-all Length	18 3/4 ± 3/8 inches
Greatest Bulb Diameter	12 7/16 inches (tolerance of +1/16" -1/8" or ± 1/8")
Neck Length	8 1/4 inches
Bulb Number (ASA Designation)	J99 1/2 A1
Bulb Contact	Recessed Small-cavity Cap (JETEC No. J1-21)
Base	Small-shell Duodecal (5-Pin JETEC No. B5-57 or 7-Pin 12D)
Basing Designation	12N
Net Weight (approximate)	11 3/4 pounds
Mounting Position	Any

Bulb Contact and Alignment

The high-voltage anode connection is made via a recessed small cavity cap located on the cone of the bulb. The anode contact is aligned with the vacant pin position No. 3 (or Pin No. 3 position) on the base, with an alignment tolerance of ±10 degrees or ±30 degrees depending on the manufacturer's specification.

Base and Pin Connections

The tube utilizes a small-shell duodecal base. Depending on the manufacturer, this base is supplied as either a 5-pin configuration (JETEC No. B5-57) or a 7-pin configuration ([12D](#)). In both configurations, the active electrical connections remain identical, with the 7-pin version including pins 6 and 7 as "no connection" (NC) pins.

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

- **Pin 1:** Heater
- **Pin 2:** Grid No. 1
- **Pin 6:** No Connection (omitted on 5-pin bases)
- **Pin 7:** No Connection (omitted on 5-pin bases)
- **Pin 10:** Grid No. 2
- **Pin 11:** Cathode
- **Pin 12:** Heater
- **Cap:** Anode (Anode and Grid No. 3 are connected together internally and terminated at the recessed small cavity cap)

Electrical Ratings and Design-Center Values

The maximum ratings for the 12LP4A are established under the Design-Center system (such as RMA Standard MB-210). Under this system, the ratings provide a ten-percent safety factor; the tube is designed to withstand the combined effects of variations in line voltage and associated components, provided the design-center values are not exceeded by more than ten percent.

Rating Parameter	Design-Center Maximum Value
Anode Voltage	12,000 Max Volts DC
Grid No. 2 Voltage	410 Max Volts DC
Grid No. 1 Negative-Bias Value	125 Max Volts DC
Grid No. 1 Positive-Bias Value	0 Max Volts DC
Grid No. 1 Positive-Peak Value	2 Max Volts
Grid No. 1 Circuit Resistance	1.5 Max Megohms

Heater and Cathode Ratings

The heater is designed for operation from either an AC or DC supply. The nominal heater voltage is 6.3 Volts, and the nominal heater current is 0.6 Amperes (with a $\pm 10\%$ tolerance specified by some manufacturers).

The peak heater-cathode voltage ratings vary between manufacturer specifications:

- **Heater Negative with Respect to Cathode (Warm-up):** During an equipment warm-up period not exceeding 15 seconds, the maximum peak voltage is rated at 410 Volts DC by some manufacturers, while others specify a limit of 125 Volts.
- **Heater Negative with Respect to Cathode (After Warm-up):** The maximum peak voltage is rated at 140 Volts DC.
- **Heater Positive with Respect to Cathode:** The maximum peak voltage is rated at 140 Volts DC by some manufacturers, and 125 Volts by others.

To ensure proper operation and longevity, the cathode should be returned to one side or to the center tap of the heater transformer winding.

Typical Operating Conditions

The 12LP4A is typically operated with an anode voltage of 11,000 Volts DC. While the tube can operate at lower anode potentials, both brightness and focusing quality decrease with decreasing anode voltage; operation below 8,000 Volts is generally not recommended.

The typical operating parameters vary slightly depending on the design of the receiver and the manufacturer's recommended operating point:

- **Anode Voltage:** 11,000 Volts DC
- **Grid No. 2 Voltage:** 250 Volts DC or 300 Volts DC
- **Grid No. 1 Voltage (for visual extinction of undeflected focused spot or raster):** -27 to -63 Volts DC, or -28 to -72 Volts DC
- **Grid No. 1 Circuit Resistance:** 1.5 Megohms (Maximum)

Focusing and Deflection Requirements

The 12LP4A requires external magnetic focusing and deflection components. The deflection angle of the tube is approximately 54 degrees.

The focusing coil current depends on the specific coil used and its physical placement along the neck of the tube:

- When using a standard focusing coil (such as JETEC No. 106 or equivalent) positioned at a distance of 3 1/4 inches from the reference line to the center of the focus coil air gap, the approximate focusing current required is **110 mA DC**. This is typically measured with the bias adjusted to produce a highlight brightness of 20 foot-lamberts on a 7 1/2 by 10 inch picture area, sharply focused at the center of the screen.
- When the focusing coil is positioned at a distance of 4 1/2 inches from the yoke-reference-line to the center of the air gap, the approximate focusing current required is **96 mA DC**.

Ion-Trap Magnet

The electron gun of the 12LP4A must be used with an external double-field ion-trap magnet. The ion-trap magnet must be adjusted to its optimum position on the neck of the tube (approximately 6 1/4 inches from

the base). The required magnetic field strength is approximately **35 Gauss**, which is equivalent to a current of 120 milliamperes through a standard JETEC ion-trap magnet No. 108.

Capacitances and Circuit Function

The direct interelectrode capacitances of the tube are approximately:

- **Cathode to all other electrodes:** 5 μF
- **Grid No. 1 to all other electrodes:** 6 μF

The tube also features an external conductive coating. When this coating is properly grounded, it forms a capacitor in conjunction with the internal anode coating. The capacitance of this structure is rated as:

- **Maximum External Coating to Anode:** 3,000 μF
- **Minimum External Coating to Anode:** 750 μF

In practical receiver circuits, this capacitance acts as a high-voltage filter capacitor for the anode power supply, helping to smooth the rectified high-voltage output.

Safety and X-Ray Radiation Considerations

When operating the 12LP4A at high voltages, safety precautions regarding X-ray radiation must be observed. Prolonged exposure to X-rays at close range can present a danger of personal injury. If the tube is operated at voltages exceeding the manufacturer's maximum rated anode voltage (12,000 Volts DC) or 16,000 Volts (whichever is less), appropriate X-ray radiation shielding may be necessary to protect users and service technicians.

Technical Summary

The **12LP4A** is a 12-inch, all-glass, round television picture tube utilizing magnetic deflection (54-degree angle) and magnetic focusing. It is characterized by its gray neutral-density faceplate, which provides a 66% light transmission rate to enhance picture contrast under high ambient light. The tube operates with a nominal 6.3 V, 0.6 A heater and is designed for a maximum anode voltage of 12,000 Volts DC, with typical operation at 11,000 Volts DC. It features a duodecal base (5-pin or 7-pin) and requires an external double-field ion-trap magnet (35 Gauss) and a focusing coil (typically requiring 96 to 110 mA DC depending on positioning). Grounding the external conductive coating provides an integrated high-voltage filter capacitance of 750 to 3,000 μF .



SOURCE OPERATING CONDITIONS

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Cathode Ray

CHARACTERISTICS

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor	P4	—
Deflection method	Magnetic	—



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
Heater voltage	6.3 V	Nominal
Heater current	600 mA	Nominal



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	6.3 V	—
Heater Current	600 mA	—
Focusing Method	Magnetic text	—
Deflection Method	Magnetic text	—
Fluorescence	White text	—
Persistence	Medium text	—
Phosphor	P4 text	—
Deflection Angle	54 deg	Approximate
Faceplate	Gray Filter Glass text	—
Ion Trap	External Double Field text	—
External Coating-to-Anode Capacitance Minimum	750 pF	—
External Coating-to-Anode Capacitance Maximum	3000 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Anode Voltage	12000 V	—
Maximum Grid2 Voltage	410 V	—
Maximum Grid1 Negative Bias	125 V	—
Maximum Grid1 Positive Peak	2 V	—
Anode Voltage	11000 V	—
Grid2 Voltage	250 V	—
Grid1 Cutoff Voltage Minimum	-63 V	—
Grid1 Cutoff Voltage Maximum	-27 V	—
Focusing Coil Current	110 mA	Approximate
Ion Trap Magnet Field Strength	35 gauss	Approximate
Maximum Grid1 Circuit Resistance	1.5 Mohm	—

An independent reference for electronic tubes, vacuum tubes,
and their source documents.

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