



ELECTRONIC TUBE REFERENCE

12ASP7

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

CATHODERAY

Cathode-ray display tube documented by manufacturer data for type 12ASP7; available extracted source information is sparse, so no more specialized application or construction claim is made.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	14
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

No fixed ratings recorded.

Electrostatic CRT electron-gun/beam section.

12ASP7 — Electrostatic Focus and Deflection Cathode Ray Tube

A 12-inch round glass cathode ray tube featuring post-acceleration, electrostatic focus, and electrostatic deflection, designed for radar and oscillographic applications.

Overview

The **12ASP7** is a specialized 12-inch round glass cathode ray tube (CRT) designed for radar and oscillographic display systems. It utilizes electrostatic methods for both focusing and deflecting the electron beam. A defining feature of the 12ASP7 is its post-acceleration design, which ensures maximum deflection sensitivity while maintaining high screen brightness.

To optimize optical performance, the tube incorporates an aluminized screen. This design increases the overall light output, minimizes undesirable screen charging, and prevents ion-spot blemishes that can degrade the phosphor over time. The 12ASP7 is part of a broader family of tubes (including the 12ASP14, 12ASP19, and 12ASP25) that share identical electrical and mechanical characteristics but differ in their phosphor screen compositions to suit specific visual persistence and color requirements.

Optical and Phosphor Characteristics

The 12ASP- series is supplied with various phosphor options depending on the intended application. The primary variants and their optical properties are:

Tube Designation	Phosphor Number	Fluorescent Color	Phosphorescent Color	Persistence
12ASP7	P7	Blue-White	Yellow	Long
12ASP14	P14	Purple	Orange	Medium Long
12ASP19	P19	Orange	Orange	Long
12ASP25	P25	Orange	Orange	Long

The long-persistence characteristics of the P7, P19, and P25 phosphors make them highly suitable for radar indicators where target traces must remain visible between antenna scans.

Mechanical Specifications and Alignment

The 12ASP7 is a physically robust tube with precise mechanical tolerances to ensure accurate alignment of the electron gun and deflecting electrodes relative to the screen.

Physical Dimensions

- **Over-all Length:** 22-3/4 ± 3/8 inches
- **Greatest Bulb Diameter:** 12-7/16 + 1/16 - 3/32 inches
- **Minimum Useful Screen Diameter:** 11.0 inches
- **Mounting Position:** Any

Connection Interfaces

- **Base:** Medium Shell Diheptal 12-pin base (JETEC No. B12-37)
- **Bulb Contact:** Recessed small-cavity cap (JETEC No. J1-22) for the post-accelerator connection
- **Neck Contacts:** Small ball caps (JETEC No. J1-25) for direct connection to the deflecting electrodes

Alignment Tolerances

- **Bulb Contact Alignment:** The J1-22 bulb contact aligns with the trace of deflecting electrodes D3-D4 within ± 10 degrees.

- **Base Alignment:** Pin No. 11 aligns with the J1-22 bulb contact within ± 10 degrees.
- **Neck Contact Alignment:** The D1-D2 trace aligns with the neck button (A2) and the tube axis within ± 10 degrees.
- **Trace Alignment:** The angle between the D3-D4 and D1-D2 traces is 90 ± 1 degrees.
- **Deflection Direction:** A positive voltage applied to deflecting electrode D1 deflects the electron beam approximately away from the neck button (A2). A positive voltage applied to deflecting electrode D3 deflects the beam approximately away from the post-accelerator button.

Electrical Characteristics and Pinout

The 12ASP7 requires a standard 6.3 V heater supply. The electrical connections are distributed between the 12-pin diheptal base, the neck contacts, and the recessed bulb contact.

Heater Ratings

- **Heater Voltage:** 6.3 Volts
- **Heater Current:** 0.6 $\pm$ 10% Amperes
- **Heater Supply:** AC or DC

Base Pin Connections

The active pins on the B12-37 diheptal base are assigned as follows (viewed from the bottom of the base):

Pin Number	Element
1	Heater
2	Cathode
3	Grid No. 1
5	Focusing Electrode
8	Grid No. 2
14	Heater

Note: The anode, Grid No. 2, and Grid No. 4 are connected together internally within the tube and are collectively referred to as the "anode" at the terminal.

Direct Interelectrode Capacitances

The approximate capacitances between the internal electrodes are:

Electrode Configuration	Capacitance
Cathode to All Other Electrodes	6.0 $\pm$ f

Electrode Configuration	Capacitance
Grid-No. 1 to All Other Electrodes	7.5 μf
<u>D1</u> to <u>D2</u>	4.0 μf
D3 to D4	3.0 μf
<u>D1</u> to All Other Electrodes	12.0 μf
<u>D2</u> to All Other Electrodes	12.0 μf
D3 to All Other Electrodes	6.5 μf
D4 to All Other Electrodes	6.5 μf

Design-Center Maximum Ratings

The maximum ratings for the 12ASP7 are defined under the Design-Center Rating System. This system provides a ten percent safety factor; the tube is engineered to withstand normal variations in line voltage and component tolerances, provided these design-center limits are not exceeded by more than ten percent under nominal operating conditions.

- **Post-Accelerator Voltage:** 16,000 Max Volts DC
- **Anode Voltage:** 8,000 Max Volts DC
- **Ratio of Post-Accelerator Voltage to Anode Voltage:** 2.5 Max
- **Anode Input:** 6 Max Watts
 - *Calculation:* Anode input is calculated as the product of the anode voltage and the average current measured at the terminal: Anode Input = Anode Voltage x Average Current.
- **Focusing-Electrode Voltage:** 3,000 Max Volts DC
- **Grid No. 2 Voltage:** 700 Max Volts DC
- **Grid-No. 1 Voltage:**
 - Negative-Bias Value: 300 Max Volts DC
 - Positive-Bias Value: 0 Max Volts DC
 - Positive-Peak Value: 2 Max Volts
- **Peak Heater-Cathode Voltage:**
 - Heater Negative with Respect to Cathode: 180 Max Volts DC
 - Heater Positive with Respect to Cathode: 180 Max Volts DC
- **Peak Voltage Between Anode and Any Deflecting Electrode:** 1,500 Max Volts

Typical Operating Conditions and Performance

Under typical operating conditions, the 12ASP7 is configured with a high post-accelerator voltage relative to the anode to achieve a bright, sharp trace while maintaining high deflection sensitivity.

Operating Voltages and Currents

- **Post-Accelerator Voltage:** 9,700 Volts DC
- **Anode Voltage:** 6,100 Volts DC
- **Focusing-Electrode Voltage:** 1,750 to 2,220 Volts DC
- **Grid No. 2 Voltage:** 300 Volts DC
- **Grid No. 1 Voltage (for visual extinction of focused undeflected spot):** -40 to -77 Volts DC
- **Modulation Factor:** 30 Max Volts (measured for a post-accelerator current of 25 microamperes DC in accordance with MIL-E-1 specifications)
- **Focusing Electrode Current (for any operating condition):** -15 to +10 Microamperes

Deflection and Resolution

- **Deflecting Factors (D1 and D2):** 115 to 135 Volts DC Per Inch
- **Deflecting Factors (D3 and D4):** 115 to 135 Volts DC Per Inch
- **Undeflected Spot Position:** The center of the focused, undeflected spot lies within a square of 20 millimeters radius centered on the tube face.
- **Line Width:** 0.5 Max Millimeters (measured in accordance with MIL-E-1 specification, paragraph 4.12.6.1, at a post-acceleration current of 25 microamperes DC).

Circuit Design Values

To ensure stable operation and prevent spot distortion or focus drift, the external circuit resistances must be kept within the following limits:

- **Grid No. 1 Circuit Resistance:** 2.0 Max Megohms
- **Resistance in Any Deflecting Electrode Circuit:** 5.0 Max Megohms
- **Deflection Resistance Balance:** It is recommended that the resistance in each of the deflecting electrode circuits be approximately equal to maintain balanced deflection characteristics.

Technical Summary

The **12ASP7** is a 12-inch electrostatic focus and deflection cathode ray tube designed for radar and oscillographic applications. Operating with a typical post-accelerator voltage of 9,700 V and an anode voltage of 6,100 V, it provides a highly focused trace with a maximum line width of 0.5 mm and a deflection factor of 115 to 135 V DC per inch on both axes. Its aluminized screen, available in P7, P14, P19, and P25 phosphors, ensures high light output and prevents screen degradation. The tube utilizes a 12-pin diheptal base and operates from a standard 6.3 V, 0.6 A heater supply.