

ELECTRONIC TUBE REFERENCE

14AP1

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Fourteen-inch large-screen cathode-ray tube for television and oscillographic service. It uses electrostatic focusing and deflection with a P1 green, medium-persistence screen, making it suitable for direct-view visual display and instrument-trace applications.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	2.5 V / 2.1 A	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.

14AP1 — Electrostatic Cathode-Ray Tube

The **14AP1** is a 14-inch, electrostatic-deflection and electrostatic-focus cathode-ray tube designed primarily for television and large-screen oscillographic applications. Developed by Allen B. Du Mont Laboratories, Inc., and originally designated as the 2531A14, this tube features high-voltage insulation, specialized sealing, and widely spaced lead wires to facilitate operation at high accelerating potentials.

Overview

The 14AP1 is characterized by its large glass bulb, which has a nominal diameter of approximately 14 inches. It is designed to provide a brilliant television picture measuring 8 inches by 10 inches. For oscillographic applications, it offers a usable screen diameter of approximately 11 inches.

The tube utilizes a **P1 phosphor**, which produces a **green fluorescence** with **medium persistence**. This makes it highly suitable for visual observation of waveforms and television images. Other variants in the same family, such as the [14AP2](#), [14AP4](#), and [14AP5](#), utilize different phosphors (P2, P4, and P5 respectively) to achieve different colors and persistence characteristics, but they share the same underlying physical and electrical structure as the 14AP1.

Mechanical Construction and Installation

The physical structure of the 14AP1 is designed to withstand the significant atmospheric pressure stresses associated with its large evacuated volume. During production, the glass bulb (designated as type C107Z3C) is pressure-tested to withstand forces greater than three atmospheres.

Physical Dimensions

- **Overall Length:** 24-1/4 ± 3/8 inches
- **Maximum Diameter:** 13-5/8 ± 1/4 inches
- **Bulb Designation:** C107Z3C
- **Base:** 12-contact peripheral base
- **Basing Designation:** RMA 12A

Installation and Mounting Guidelines

The 14AP1 can be mounted in any physical orientation. The 12-contact socket can be supported directly by the base of the tube. For horizontal mounting, a recommended arrangement consists of:

1. A rubber block supporting the neck of the bulb.
2. A padded support supporting the screen end of the tube.
3. The electrical socket supported by the base of the tube itself.

Because of the mechanical strain on the large glass envelope, the tube must be protected from physical impacts and sudden, extreme changes in temperature. Additionally, care must be taken to avoid scratching the glass, as surface scratches can severely weaken the bulb structure. When installed in television receivers, it is highly recommended to place a protective sheet of plate glass directly in front of the tube screen to guard against accidental impact.

Electrical Connections and Basing

The 14AP1 uses a 12-contact peripheral base with the RMA Basing Designation **12A**. The pin connections, viewed from the bottom of the base, are assigned as follows:

Pin Number	Connection
1	No Connection
2	Control Electrode (Grid)
3	Heater & Cathode

Pin Number	Connection
4	Heater
5	No Connection
6	Focusing Electrode (Anode #1)
7	Intensifier Electrode (Anode #3)
8	Deflection Plate D4
9	Deflection Plate <u>D2</u>
10	Accelerating Electrode (Anode #2)
11	Deflection Plate <u>D1</u>
12	Deflection Plate D3

Deflection Plate Alignment and Behavior

The internal deflection plates are aligned relative to the external base structure to ensure predictable trace orientation:

- The trace produced on the screen by deflecting electrodes D3 and D4 will not deviate more than $\pm 10^\circ$ from a plane passing through the center of the locating key and the longitudinal axis of the tube.
- The angle between the trace produced by D3/D4 and the trace produced by D1/D2 is precisely $90^\circ \pm 3^\circ$.
- When deflecting electrode D1 (pin 11) is positive with respect to D2 (pin 9), the electron beam spot is deflected approximately toward pin 9.
- When deflecting electrode D3 (pin 12) is positive with respect to D4 (pin 8), the spot is deflected approximately toward pin 7.

Interelectrode Capacitances

The direct interelectrode capacitances of the 14AP1 are specified as follows:

Electrode Relationship	Capacitance (uuf / pF)
Control Electrode (Grid) to all other electrodes	6.0
Deflecting Plate <u>D1</u> to Deflecting Plate <u>D2</u>	2.7
Deflecting Plate D3 to Deflecting Plate D4	1.0
Deflecting Plate <u>D1</u> to all other electrodes	8.3
Deflecting Plate D3 to all other electrodes	7.7

Electrode Relationship	Capacitance (uuf / pF)
<u>D1</u> to all other electrodes except <u>D2</u>	5.6
<u>D2</u> to all other electrodes except <u>D1</u>	5.7
D3 to all other electrodes except D4	6.7
D4 to all other electrodes except D3	6.8

Technical Ratings and Typical Operation

The electrical design of the 14AP1 incorporates an intensifier electrode (Anode #3) to permit high accelerating potentials, which increases trace brightness while maintaining deflection sensitivity.

Absolute Maximum Ratings

- **Heater Voltage:** 2.5 V
- **Heater Current:** 2.1 ± 0.3 A
- **Anode #3 (Intensifier Electrode) Voltage (Eb3):** 8000 V (max.)
- **Anode #2 (Accelerating Electrode) Voltage (Eb2):** 4000 V (max.)
- **Anode #1 (Focusing Electrode) Voltage (Eb1):** 1800 V (max.)
- **Grid (Control Electrode) Voltage (Ec1):** Never positive
- **Resistance of Grid Circuit:** 1.5 Megohms (max.)
- **Impedance of any Deflecting Electrode Circuit:** 1.0 Megohms (max.) at heater supply frequency

Typical Operating Conditions

The tube can be operated under different voltage configurations depending on the required brightness and deflection performance. The following table outlines two typical operating points:

Parameter	Operating Point A	Operating Point B
Heater Voltage	2.5 V	2.5 V
Anode #3 Voltage (Eb3)	4000 V	8000 V
Anode #2 Voltage (Eb2)	2000 V	4000 V
Anode #1 Voltage (<u>Eb1</u>) for focus*	500 V	1000 V $\pm$ 20%
Grid Voltage (Ec1) for beam cut-off	-40 V $\pm$ 50%	-80 V $\pm$ 50%
Deflection Factor (D1D2)	65 d.c. V/inch $\pm$ 20%	130 d.c. V/inch $\pm$ 20%
Deflection Factor (D3D4)	65 d.c. V/inch $\pm$ 20%	130 d.c. V/inch $\pm$ 20%

Parameter	Operating Point A	Operating Point B
Deflection Sensitivity (D1D2)	0.39 mm/d.c. V (av.)	0.20 mm/d.c. V (av.)
Deflection Sensitivity (D3D4)	0.39 mm/d.c. V (av.)	0.20 mm/d.c. V (av.)

– *Note: Anode #1 voltage is specified for focus when the grid voltage E_{c1} is set to 75% of the cut-off value.*

Deflection with Intensifier at Second Anode Potential

When the intensifier electrode (Anode #3) is operated at the same potential as the second anode ($E_{b3} = E_{b2}$), the deflection characteristics are defined by the following factors:

- **Deflection Factor (D1D2 and D3D4):** 28 d.c. volts/kv. inch $\pm$ 20%
- **Deflection Sensitivity (D1D2 and D3D4):** 0.91 mm. kv./d.c. volt

Technical Summary

The **14AP1** is a high-voltage, electrostatic-focus, electrostatic-deflection cathode-ray tube featuring a 14-inch screen, a green-fluorescing P1 medium-persistence phosphor, and a specialized 12-contact peripheral base. Operating with a nominal 2.5 V, 2.1 A heater supply, the tube supports intensifier voltages up to 8000 V and accelerating voltages up to 4000 V. Its mechanical design is optimized for high-pressure resistance, and its electrical configuration provides flexible operating points to balance trace brightness against deflection sensitivity for television and large-screen oscillographic displays.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1960 Du Mont

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

1960 DU MONT

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	2.5 V	—
Heater Current	2.1 A	—
Focusing Method	Electrostatic text	—
Deflection Method	Electrostatic text	—
Phosphor	P1 text	—
Fluorescence	Green text	—
Persistence	Medium text	—