

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

12AY3A

1 SECTION
CONSTRUCTION
RECTIFIER

Rectifier - Damper Diode electronic tube

Novar half-wave vacuum rectifier designed as a damper tube in television horizontal-deflection circuits, with controlled warm-up and high inverse-voltage capability.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9HP	BASE PINS	9
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

9HP - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	–	IC
PIN2	–	P – Plate (Anode)	CONNECTED
PIN3	–	–	IC
PIN4	–	H – Heater	CONNECTED
PIN5	–	H – Heater	CONNECTED
PIN6	–	–	IC
PIN7	–	P – Plate (Anode)	CONNECTED
PIN8	–	–	IC
PIN9	–	K – Cathode	CONNECTED

SECTION RATINGS

SECTION1 Rectifier	
PEAK INVERSE VOLTAGE	5000 V
NOMINAL OUTPUT CURRENT	175 mA
PEAK FORWARD CURRENT	1.1 A
FORWARD VOLTAGE DROP	32 V
MAXIMUM HEATER-CATHODE VOLTAGE	5000 V
WARM-UP TIME	11 s
Rectifier section; ratings and characteristics retained in parameter rows where not safely promotable.	

12AY3A — Half-Wave Vacuum Rectifier

The **12AY3A** is a Novar-type half-wave vacuum rectifier designed specifically for damper service in the horizontal-deflection circuits of black-and-white television receivers. It is characterized by its high voltage and current handling capabilities, making it suitable for the demanding environment of television scanning systems.

Construction, Physical Dimensions, and Basing

The 12AY3A features a Novar T-9 glass envelope construction. It utilizes a Novar Button 9-Pin base (specifically designated as the E9-89 base configuration), which features an exhaust tip located on the bottom of the base. This physical design distinguishes the 12AY3A, along with the related [6AY3B](#) and [17AY3A](#), from earlier types such as the [6AY3](#), [6AY3A](#), [12AY3](#), and [17AY3](#), which have different bulb heights or base configurations.

The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.625 inches
- **Maximum Overall Height:** 3.005 inches

Pinout and Socket Connections

The tube utilizes the **9HP** basing arrangement. When viewed from the underside of the base, the pin connections are assigned as follows:

Pin Number	Connection
Pin 1	Internal Connection (IC) — Do not use as tie point
Pin 2	Plate (P)
Pin 3	Internal Connection (IC) — Do not use as tie point

Pin Number	Connection
Pin 4	Heater (H)
Pin 5	Heater (H)
Pin 6	Internal Connection (IC) — Do not use as tie point
Pin 7	Plate (P)
Pin 8	Internal Connection (IC) — Do not use as tie point
Pin 9	Cathode (K)

Because the 12AY3A is a power-handling tube, adequate ventilation must be provided in the equipment layout to ensure reliable operation. Additionally, socket terminals 1, 3, 6, and 8 are designated as internal connections and must never be utilized as circuit tie points.

Heater and Warm-Up Characteristics

The 12AY3A is identical to the [6AY3B](#) and [17AY3A](#) except for its heater ratings. It is designed for series or parallel heater chains requiring a nominal 12.6 V supply.

Heater Parameter	Value
Heater Voltage (AC or DC)	12.6 V
Heater Current	0.600 $\pm$ 0.040 A
Average Heater Warm-up Time	11 seconds

The controlled 11-second warm-up time is an important characteristic for series-string heater designs, ensuring balanced voltage distribution across all tube heaters during the power-on phase.

Damper Service Ratings and Operating Limits

The ratings of the 12AY3A are established under the Design-Maximum Rating System for operation in a 525-line, 30-frame television system. The maximum limits for damper service are defined as follows:

- **Peak Inverse Plate Voltage:** 5000 V (The pulse duration must not exceed 15% of a horizontal scanning cycle, equivalent to 10 microseconds).
- **Steady State Peak Plate Current:** 1100 mA
- **DC / Average Plate Current:** 175 mA
- **Plate Dissipation:** 6.3 to 6.5 W (depending on the specific rating system applied).

Heater-Cathode Voltage Limits

Due to the high pulse voltages present in television horizontal deflection circuits, the insulation between the heater and cathode is subjected to severe stress. The 12AY3A is rated to withstand the following maximum heater-cathode voltages:

- **Heater Negative with Respect to Cathode:**
 - **DC Limit:** 900 V
 - **Peak / Total DC and Peak Limit:** 5000 V
- **Heater Positive with Respect to Cathode:**
 - **DC / Average Limit:** 100 V
 - **Peak / Total DC and Peak Limit:** 300 V (with some specifications listing a peak limit of +800 V and an average limit of +100 V under specific pulse conditions).

Electrical Characteristics and Capacitances

The electrical behavior of the 12AY3A is defined by its internal voltage drop and its interelectrode capacitances.

Tube Voltage Drop

The tube exhibits a low internal resistance, resulting in a low voltage drop during conduction. The instantaneous tube voltage drop is:

- **Voltage Drop:** 32 V at an instantaneous plate current of 350 mA.

Direct Interelectrode Capacitances

The approximate unshielded interelectrode capacitances of the tube are:

- **Plate to Cathode and Heater:** 6.5 pF
- **Cathode to Plate and Heater:** 9.0 pF
- **Heater to Cathode:** 2.8 pF

Technical Summary

The **12AY3A** is a Novar-based, indirectly heated half-wave vacuum rectifier designed for television damper service. Operating with a **12.6 V, 0.6 A** heater with a controlled **11-second warm-up time**, it is physically housed in a T-9 bulb with an E9-89 button base featuring a bottom exhaust tip. It is capable of handling peak inverse voltages up to **5000 V** and peak currents up to **1100 mA**, with a low internal voltage drop of **32 V** at 350 mA. The tube requires a Novar 9-contact socket, with strict adherence to the rule that pins 1, 3, 6, and 8 must not be used as circuit tie points, and adequate ventilation must be maintained during operation.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 5 of 7

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

1971 RCA HB3 BINDER 5 OF 7

Section 1 · Rectifier

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
respect to cathodes b max	5000 V	—
respect to cathode a max	300 V	—
b The dt component must not exceed	900 V	—
c The do component must not exceed o	10 V	—
Heater voltage nominal	12.6 V	—
Heater current	600 mA	—
Heater warm-up time	11 s	Average

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
P to (K,H)	6.5 pF	—
K to (P,H)	9 pF	—
Heater to cathode	2.8 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak Inverse Plate Voltage° max	5000 V	—
Peak Plate Current max	1100 mA	—
Average Plate Current max	175 mA	—
Plate Dissipation max	6.5 W	—

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1975 RCA RC30

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

1975 RCA RC30

Section 1 · Rectifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
less than	30 mA	Published value from supplied target entry
less than	35 mA	Published value from supplied target entry
Heater Voltage (ac/dc)	16.8 volts	Published value from supplied target entry
Heater Current	0.45 amperes	Published value from supplied target entry
Heater Warm-up Time (Average)	11 seconds	Published value from supplied target entry
Peak Inverse Plate Voltage#	5000 volts	Published value from supplied target entry
Peak Plate Current	1100 mA	Published value from supplied target entry
Average Plate Current	175 mA	Published value from supplied target entry
Plate Dissipation	6.5 watts	Published value from supplied target entry
Tube Voltage Drop for plate current of	32 mA	Published value from supplied target entry
Heater Voltage (ac/dc)	6.3 volts	Published value from supplied target entry
Heater Current	0.45 ampere	Published value from supplied target entry

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate to Cathode and Heater	6.5 pF	Published value from supplied target entry
Cathode to Plate and Heater	9 pF	Published value from supplied target entry
Heater to Cathode	2.8 pF	Published value from supplied target entry