

ELECTRONIC TUBE REFERENCE

12DW4A

Rectifier - Damper Diode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
RECTIFIER

Novar half-wave vacuum rectifier designed as a damper tube in television horizontal-deflection circuits.

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	
MAXIMUM PLATE DISSIPATION	6 W
PEAK INVERSE VOLTAGE	5000 V
NOMINAL OUTPUT CURRENT	200 mA
PEAK FORWARD CURRENT	1.1 A
FORWARD VOLTAGE DROP	12 V
WARM-UP TIME	11 s
<i>Promoted from published ratings/characteristics where directly applicable; additional published values retained in TUBE_SECTION_PARAMETER.</i>	

12DW4A — Half-Wave Vacuum Rectifier

The **12DW4A** is a Novar-type half-wave vacuum rectifier designed specifically for service as a damper diode in the horizontal-deflection circuits of both color and black-and-white television receivers. It is engineered to handle high-voltage pulses and significant power dissipation typical of television scanning systems.

Construction, Physical Specifications, and Basing

The 12DW4A is constructed with a Novar T-9 glass envelope and utilizes a Novar Button 9-Pin base (E9-75 designation). The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 3.030 inches
- **Maximum Overall Height:** 3.410 inches

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

- **Pin 1:** Internal Connection (IC)
- **Pin 2:** Plate (P)
- **Pin 3:** Internal Connection (IC)
- **Pin 4:** Heater (H)
- **Pin 5:** Heater (H)
- **Pin 6:** Internal Connection (IC)
- **Pin 7:** Plate (P)
- **Pin 8:** Internal Connection (IC)
- **Pin 9:** Cathode (K)

Wiring and Installation Precautions

Because the 12DW4A operates under high-voltage conditions, specific circuit layout and installation rules must be observed:

- Socket terminals 1, 3, 6, and 8 must not be used as tie points for other circuit connections.
- It is highly recommended to remove the socket clips corresponding to pins 1, 3, 6, and 8 to minimize electrical leakage and reduce the risk of high-voltage arc-over.
- As a power-handling device, the tube generates significant heat during operation and must be provided with adequate ventilation.

Heater Characteristics

The 12DW4A features an indirectly heated cathode with a heater designed for series or parallel AC/DC operation. Its heater specifications are:

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.6 A (600 mA)
- **Average Heater Warm-up Time:** 11 seconds

Family Comparisons

The 12DW4A belongs to a family of identical electrical designs that differ primarily in their heater configurations:

- **6DW4A:** Operates with a heater voltage of 6.3 V and a current of 1.2 A (1200 mA).
- **17DW4A:** Operates with a heater voltage of 16.8 V and a current of 450 mA (0.45 A), with an average warm-up time of 11 seconds.
- **6DW4B:** Shares the 6.3 V heater rating of the 6DW4A but features a shorter bulb (maximum seated height of 2.625 inches, maximum overall height of 3.005 inches) and an exhaust tip located on the base (E9-89 base).

Electrical Characteristics and Capacitances

Under typical operating conditions, the 12DW4A exhibits low internal resistance, which is critical for efficient damper service.

Tube Voltage Drop

The instantaneous tube voltage drop is a key measure of the rectifier's efficiency. For the 12DW4A, the instantaneous voltage drop is:

- **Voltage Drop:** 25 V at a plate current of 350 mA.

Direct Interelectrode Capacitances

The capacitances of the tube are measured without an external shield (unshielded):

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

Damper Service Ratings

The ratings of the 12DW4A are defined under the Design-Maximum Rating System. These limits are specified for operation in a standard 525-line, 30-frame television system.

Operating Limits

- **Maximum Peak Inverse Plate Voltage:** 5500 V. This peak limit is subject to the condition that the pulse duration must not exceed 15% of a horizontal scanning cycle (equivalent to 10 microseconds in a standard system).
- **Maximum Plate Dissipation:** 8.5 W.
- **Maximum Steady State Peak Current:** 1300 mA.
- **Maximum DC Plate Current:** 250 mA.

Heater-Cathode Voltage Ratings

The insulation between the heater and cathode is rated to withstand high potential differences, which is essential for damper service where the cathode often carries high-voltage pulses:

- **Heater Negative with Respect to Cathode:**
 - **Maximum DC Voltage:** 900 V
 - **Maximum Total DC and Peak Voltage:** 5500 V
- **Heater Positive with Respect to Cathode:**
 - **Maximum DC Voltage:** 100 V
 - **Maximum Total DC and Peak Voltage:** 300 V

(Note: While the 12DW4A and [6DW4A](#) share these heater-cathode ratings, the related [6DW4B](#) variant has a lower maximum peak negative heater-cathode voltage rating of -5000 V).

Technical Summary

The **12DW4A** is a high-performance, Novar-based half-wave vacuum rectifier optimized for television damper service. Operating with a **12.6 V, 0.6 A** heater, it provides robust power handling, including a maximum plate dissipation of **8.5 W** and a peak inverse plate voltage rating of **5500 V**. Its physical design features a Novar T-9 envelope with a 9HP pinout, requiring careful socket configuration (leaving pins 1, 3, 6, and 8 unused) to prevent high-voltage breakdown. With a low instantaneous voltage drop of **25 V** at **350 mA**, the 12DW4A delivers the high efficiency required for horizontal-deflection circuitry.

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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage (ac/dc) 6-3 12.6	16.8 V	Published in approved 17DW4A target datasheet entry; Section1
Heater Current 1-2 0.6	450 mA	Published in approved 17DW4A target datasheet entry; Section1
Heater Warm-up Time (Average) – 11	11 seconds	Published in approved 17DW4A target datasheet entry; Section1
Peak Inverse Plate Voltage*	5000 V	Published in approved 17DW4A target datasheet entry; Section1
Peak Plate Current	1100 mA	Published in approved 17DW4A target datasheet entry; Section1
Average Plate Current	200 mA	Published in approved 17DW4A target datasheet entry; Section1
Peak value -f300 –	-5000 V	Published in approved 17DW4A target datasheet entry; Section1
Average value +100	900 V	Published in approved 17DW4A target datasheet entry; Section1
Tube Voltage Drop for plate current of	140 mA	Published in approved 17DW4A target datasheet entry; Section1
Tube Voltage Drop for plate current of 140 mA	12 V	Published in approved 17DW4A target datasheet entry; Section1
£ Pulse duration must not exceed 15% of a horizontal scanning cycle (	10 microseconds	Published in approved 17DW4A target datasheet entry; Section1
Heater Voltage (ac/dc) 3.15 4.2	6.3 V	Published in approved 17DW4A target datasheet entry; Section1
Heater Current 0.6 0.45	300 mA	Published in approved 17DW4A target datasheet entry; Section1
Heater Warm-up Time (Average) 11	11 seconds	Published in approved 17DW4A target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage (Each Unit)	300 V	Published in approved 17DW4A target datasheet entry; Section1
Peak positive value	50 V	Published in approved 17DW4A target datasheet entry; Section1
DC negative value	50 V	Published in approved 17DW4A target datasheet entry; Section1
DC positive value	3 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 (Screen-Grid) Voltage	150 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.1 (Control-Grid) Voltage, Negative bias value	50 V	Published in approved 17DW4A target datasheet entry; Section1
Cathode Current	12 mA	Published in approved 17DW4A target datasheet entry; Section1
Plate Dissipation (Each Unit)	1.1 W	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Input	0.75 W	Published in approved 17DW4A target datasheet entry; Section1
Plate Voltage (Each Unit) 100	100 V	Published in approved 17DW4A target datasheet entry; Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate to Cathode and Heater	6.5 pF	Published in approved 17DW4A target datasheet entry; Section1
Heater to Cathode z	8 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No. 3 to Plate (Each Unit)	1.9 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No.1 to All Other Electrodes	6 pF	Published in approved 17DW4A target datasheet entry; Section1
Grid No.3 to All Other Electrodes (Each Unit)	3.6 pF	Published in approved 17DW4A target datasheet entry; Section1
Plate to All Other Electrodes (Each Unit)	3 pF	Published in approved 17DW4A target datasheet entry; Section1

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No-3 Voltage (Each Unit) -10	0 V	Published in approved 17DW4A target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No.2 Voltage 67.6	67.5 V	Published in approved 17DW4A target datasheet entry; Section1
Plate Current (Each Unit)	2.2 mA	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Current 6.5	3.3 mA	Published in approved 17DW4A target datasheet entry; Section1
Cathode Current 6.6	7.8 mA	Published in approved 17DW4A target datasheet entry; Section1
Plate Voltage 100	100 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.3 Voltage 0	0 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.2 Voltage 67.5	67.5 V	Published in approved 17DW4A target datasheet entry; Section1
Grid-No.3 Transconductance	180 μS	Published in approved 17DW4A target datasheet entry; Section1