



ELECTRONIC TUBE REFERENCE

12BT3

Rectifier - Damper Diode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
RECTIFIER

Compactron television damping diode designed for horizontal-deflection sweep-circuit service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	12
NOMINAL HEATER	12.6 V / 450 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Rectifier	
MAXIMUM PLATE DISSIPATION	5.3 W
PEAK INVERSE VOLTAGE	3300 V
<i>TV damping diode.</i>	

12BT3 — Half-Wave Vacuum Rectifier Compactron Diode

An indirectly heated, single-diode compactron device designed for service as a damping diode in the horizontal-deflection circuits of television receivers.

Overview

The **12BT3** is a half-wave vacuum rectifier, constructed in a compactron configuration containing a single diode. It is specifically designed to operate as a TV damping diode in the horizontal-deflection circuits of television receivers. The tube features a coated unipotential cathode and is housed in a T-9 glass envelope with a 12-pin button base. It is engineered to withstand the high peak inverse voltages and high peak

currents characteristic of television horizontal-deflection systems operating under standard scanning configurations.

Mechanical Design and Base Configuration

The 12BT3 utilizes a **T-9 glass envelope** and a **button 12-pin base** designated as **E12-70**. This physical configuration requires a standard duodecar 12-contact socket. The physical dimensions of the device are defined by the following maximum limits:

- **Maximum Diameter:** 1.188 inches
- **Maximum Over-all Length:** 2.625 inches
- **Maximum Seated Height:** 2.250 inches

The tube can be operated in **any position**.

The terminal connections are arranged according to the **EIA 12BL** basing diagram. The pin assignments, viewed from the underside of the base, are as follows:

Pin	Connection
Pin 1	Heater
Pin 2	No Connection
Pin 3	No Connection
Pin 4	Plate
Pin 5	No Connection (Socket terminal must not be used as a tie point)
Pin 6	No Connection (Socket terminal must not be used as a tie point)
Pin 7	Cathode
Pin 8	No Connection (Socket terminal must not be used as a tie point)
Pin 9	No Connection (Socket terminal must not be used as a tie point)
Pin 10	Plate
Pin 11	No Connection
Pin 12	Heater

The internal plate connection is brought out to both Pin 4 and Pin 10. To prevent circuit interference or unintended electrical paths, socket terminals 5, 6, 8, and 9 must not be utilized as circuit tie points.

Heater and Electrical Characteristics

The 12BT3 features an indirectly heated, coated unipotential cathode. The heater is designed for operation on either AC or DC power.

Heater Parameter	Value
Nominal Heater Voltage (AC or DC)	12.6 V
Nominal Heater Current	0.45 ± 0.03 A
Heating Method	Indirect
Cathode Type	Coated unipotential

The nominal heater voltage of 12.6 V is specified for a bogey tube operating at a heater current of 0.45 A. Equipment designers must ensure that the heater supply is restricted to maintain the heater current centered at this specified bogey value within the defined tolerance.

Using the nominal values, the calculated heater power is:

$$\text{Heater Power} = 12.6 \text{ V} \times 0.45 \text{ A} = 5.67 \text{ W}$$

This calculation is derived from the nominal heater voltage of 12.6 V and the nominal heater current of 0.45 A.

Direct Interelectrode Capacitances

The approximate direct interelectrode capacitances of the 12BT3, measured without an external shield, are:

- **Cathode to Plate and Heater (k to $[p + h]$):** 8.5 pF
- **Plate to Cathode and Heater (p to $[k + h]$):** 7.0 pF
- **Heater to Cathode (h to k):** 2.7 pF

TV Damper Service Ratings and Operating Conditions

The maximum ratings of the 12BT3 are established under the **Design-Maximum System**. These ratings represent limiting values of operating and environmental conditions for a bogey tube and must not be exceeded under the worst probable operating conditions, including supply-voltage variations, component tolerances, and equipment control adjustments.

For operation in a standard **525-line, 30-frame television system**, the design-maximum ratings for damper service are:

Parameter	Design-Maximum Value
Peak Inverse Plate Voltage	3300 V

Parameter	Design-Maximum Value
Plate Dissipation	5.3 W
Steady-State Peak Plate Current	1000 mA
DC Output Current (Average Plate Current)	165 mA

Pulse Duration Constraints

The peak inverse plate voltage rating of 3300 V is a specialized pulsed limit. The duty cycle of the voltage pulse must not exceed **15 percent of one scanning cycle**. In a standard horizontal scanning cycle, this pulse duration is restricted to a maximum of **10 microseconds**.

Heater-Cathode Voltage Ratings

Due to the high-voltage pulses present in horizontal-deflection circuits, the heater-cathode insulation of the 12BT3 is highly rated, with separate limits depending on the polarity of the heater with respect to the cathode:

- **Heater Positive with Respect to Cathode:**
 - **DC Component (Average Value):** 100 V
 - **Total DC and Peak (Peak Value):** 300 V
- **Heater Negative with Respect to Cathode:**
 - **DC Component (Average Value):** 600 V
 - **Total DC and Peak (Peak Value):** 3300 V

Average Plate Characteristics and Voltage Drop

The 12BT3 exhibits a low internal voltage drop during conduction, which is a critical characteristic for efficient damping service.

- **Tube Voltage Drop:** The instantaneous tube voltage drop is **21 Volts** at a plate current (I_b) of **250 Milliamperes DC**.

The average plate characteristics of the tube under rated heater voltage ($E_f = \text{Rated Value}$) demonstrate the relationship between plate current and plate voltage:

- At a plate voltage of approximately **10 Volts**, the plate current is approximately **100 mA**.
- At a plate voltage of approximately **21 Volts**, the plate current reaches the characteristic **250 mA** point.
- At a plate voltage of approximately **30 Volts**, the plate current rises to approximately **460 mA**.
- At a plate voltage of approximately **40 Volts**, the plate current reaches approximately **680 mA**.

This steep curve indicates low plate resistance during the conduction cycle, minimizing power loss and heat dissipation within the tube envelope during horizontal retrace damping.

Technical Summary

The **12BT3** is a specialized **duodecar-type compactron half-wave vacuum rectifier** designed specifically for TV damper service in horizontal-deflection circuits. Operating with a **12.6 V, 0.45 A** heater, it provides robust performance with a peak inverse plate voltage rating of **3300 V** (for pulses up to 10 microseconds) and a plate dissipation limit of **5.3 W**. Its physical design features a T-9 glass envelope, a button 12-pin base, and a unipotential cathode with high heater-to-cathode insulation ratings (up to 3300 V peak when the heater is negative). With a low voltage drop of **21 V at 250 mA**, the 12BT3 ensures efficient energy recovery and damping in television receiver circuits.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Rectifier

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak Inverse Plate Voltage	3300 V	TVDamper
Plate Dissipation	5.3 W	TVDamper
Steady-State Peak Plate Current	1000 mA	TVDamper
DC Output Current	165 mA	TVDamper

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