



ELECTRONIC TUBE REFERENCE

17AX3

Rectifier - Damper Diode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

RECTIFIER

Half-wave vacuum rectifier designed for television horizontal-deflection damper service, with approximately 5 kV peak-inverse capability and controlled heater warm-up.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12BE	BASE PINS	12
NOMINAL HEATER	16.8 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	5000 V
NOMINAL OUTPUT CURRENT	165 mA
PEAK FORWARD CURRENT	1 A
FORWARD VOLTAGE DROP	32 V
MAXIMUM HEATER-CATHODE VOLTAGE	5000 V
WARM-UP TIME	11 s
<i>Reference/equivalence-only source does not reproduce the referenced electrical ratings/characteristics; promoted values intentionally not inferred from external datasheets.</i>	

17AX3 — Half-Wave Vacuum Rectifier

The **17AX3** is a half-wave vacuum rectifier designed primarily for service as a damping diode (damper tube) in the horizontal-deflection circuits of television receivers. It is constructed as a Compactron

(Duodecar) type tube with a coated unipotential cathode. The 17AX3 is electrically identical to the [6AX3](#) and [12AX3](#) vacuum tubes, differing only in its heater ratings and characteristics.

Construction, Physical Dimensions, and Installation

The 17AX3 features a Compactron construction utilizing a T-9 glass bulb outline (JEDEC 9-59) and a button 12-pin base (E12-70). This design provides a compact and robust envelope capable of withstanding the high-voltage pulses typical of television deflection systems.

The physical dimensions of the tube are as follows:

- **Maximum Overall Length:** 2.625 inches (or approximately 2.596 inches depending on the specific manufacturing outline)
- **Maximum Seated Height:** 2.250 inches
- **Maximum Diameter:** 1.188 inches

The tube can be mounted in **any position**. Because of the thermal dissipation associated with damper service, the equipment layout must provide adequate ventilation around the tube envelope to prevent overheating.

Heater Characteristics and Warm-up

The 17AX3 heater is designed for series-string or parallel operation, with controlled warm-up characteristics to minimize voltage surges in series-connected heater strings.

Heater Parameter	Value
Nominal Heater Voltage (AC or DC)	16.8 V
Nominal Heater Current	0.45 A (450 mA)
Heater Current Tolerance	±0.03 A (±30 mA)
Average Heater Warm-up Time	11 seconds

The average heater warm-up time is defined under specific test conditions: it is the time required for the voltage across the heater to reach 80% of its nominal (bogey) value (16.8 V) when four times this bogey voltage is applied to a circuit consisting of the tube heater in series with an external resistance. This series resistance is calculated as three times the bogey heater voltage divided by the bogey heater current:

Series Resistance = $3 \times \frac{16.8 \text{ V}}{0.45 \text{ A}} = 112 \text{ } \Omega$

Equipment designers must ensure that the nominal operating heater current is centered at the 0.45 A bogey value, and supply variations must be restricted to keep the heater current within the specified ±30 mA tolerance.

Pinout and Basing Configurations

The 17AX3 utilizes a 12-pin button base. Depending on the manufacturer and production run, two distinct basing diagrams—**12BL** and **12FX**—are documented for this tube.

Basing Diagram 12BL

In the 12BL configuration, the connections are as follows:

- **Pin 1:** Heater (H)
- **Pin 2:** No Connection (NC)
- **Pin 3:** No Connection (NC)
- **Pin 4:** Plate (P) or Internal Connection (IC)
- **Pin 5:** No Connection (NC) or Internal Connection (IC) — *Do not use as a tie point*
- **Pin 6:** No Connection (NC) or Internal Connection (IC) — *Do not use as a tie point*
- **Pin 7:** Cathode (K)
- **Pin 8:** No Connection (NC) or Internal Connection (IC) — *Do not use as a tie point*
- **Pin 9:** No Connection (NC) or Internal Connection (IC) — *Do not use as a tie point*
- **Pin 10:** Plate (P)
- **Pin 11:** No Connection (NC)
- **Pin 12:** Heater (H)

Note on 12BL: Pins 5, 6, 8, and 9 must not be used as circuit tie points, even if they are designated as No Connection or Internal Connection, to prevent voltage breakdown or parasitic coupling.

Basing Diagram 12FX

In the alternative 12FX configuration, the connections are mapped differently:

- **Pin 1:** Internal Connection (IC)
- **Pin 2:** Plate (P)
- **Pin 3:** No Connection (NC)
- **Pin 4:** Heater (H)
- **Pin 5:** Heater (H)
- **Pin 6:** No Connection (NC)
- **Pin 7:** Cathode (K)
- **Pin 8:** Internal Connection (IC)
- **Pin 9:** Internal Connection (IC)
- **Pin 10:** Plate (P)
- **Pin 11:** No Connection (NC)
- **Pin 12:** No Connection (NC)

Electrical Characteristics and Capacitances

The 17AX3 is characterized by low internal resistance and high heater-cathode insulation, which are essential for its role as a damper diode.

Direct Interelectrode Capacitances

The capacitances of the tube, measured without an external shield, are:

- **Plate to Cathode and Heater [P to (K+H)]:** 5.5 pF
- **Cathode to Plate and Heater [K to (P+H)]:** 7.5 pF
- **Heater to Cathode [H to K]:** 2.8 pF

Typical Operating Characteristics

Under typical operating conditions, the tube exhibits a low forward voltage drop:

- **Tube Voltage Drop:** 32 V (measured at a direct plate current of 250 mA)

Plate Characteristic Curves

The plate current (I_b) versus plate voltage (E_b) relationship at the nominal heater voltage of 16.8 V displays a smooth, non-linear, exponential-like curve. This behavior is characteristic of space-charge-limited diode conduction:

- At 0 V plate potential, the plate current is 0 mA.
- At approximately 18 V, the current rises to 100 mA.
- At approximately 36 V, the current reaches 300 mA.
- At approximately 50 V, the current reaches 500 mA.
- At approximately 67 V, the current reaches 750 mA.

This low forward impedance ensures high efficiency and minimal power loss during the conduction phase of the horizontal deflection cycle.

Maximum Ratings and Damper Service

The ratings of the 17AX3 are defined under the **Design-Maximum Rating System** (EIA Standard RS-239) for television damper service in a 525-line, 30-frame scanning system. These limits must not be exceeded under the worst-case operating conditions.

Parameter	Design-Maximum Rating
Peak Inverse Plate Voltage	5000 V
Plate Dissipation	5.3 W
Steady-State Peak Plate Current	1000 mA

Parameter	Design-Maximum Rating
DC Output Current (Average Plate Current)	165 mA

Pulse Duty Cycle Constraints

The peak inverse plate voltage rating of 5000 V is a pulsed rating. The duty cycle of this voltage pulse must not exceed 15% of one horizontal scanning cycle (which corresponds to a maximum pulse duration of 10 microseconds in a standard television receiver).

Heater-Cathode Voltage Limits

Because the cathode of a damper diode is subjected to high-voltage pulses from the deflection yoke, the 17AX3 is designed with robust heater-cathode insulation. The maximum allowable voltages between the heater and the cathode are:

- **Heater Negative with Respect to Cathode:**
 - **DC Component:** 900 V
 - **Total DC and Peak Value:** 5000 V
- **Heater Positive with Respect to Cathode:**
 - **DC Component:** 100 V
 - **Total DC and Peak Value:** 300 V

These ratings allow the heater to be operated near ground potential even when the cathode experiences severe high-voltage transients during horizontal retrace.

Technical Summary

The **17AX3** is a Compactron-type, half-wave vacuum rectifier designed specifically for television horizontal damper service. Operating with a **16.8 V, 0.45 A** heater, it features controlled warm-up characteristics and high heater-cathode insulation capable of withstanding peak negative pulses up to **5000 V**. With a low forward voltage drop of **32 V at 250 mA** and a maximum plate dissipation of **5.3 W**, the 17AX3 provides efficient energy recovery and damping in television deflection systems. It is physically housed in a T-9 glass envelope with a 12-pin button base, supporting either the 12BL or 12FX basing configurations.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Rectifier

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MaximumHeaterCathodeVoltageNegativePeak	5000 V	—
MaximumHeaterCathodeVoltagePositivePeak	300 V	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Rectifier

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
CATHODE TO PLATE AND HEATER: K TO (P+H)	7.5 pF	Published datasheet
PLATE TO CATHODE AND HEATER: P TO (K+H)	5.5 pF	Published datasheet
HEATER TO CATHODE: (H TO K)	2.8 pF	Published datasheet
DESIGN MAXIMUM VALUES - SEE EIA STANDARD RS	9 mA	Published datasheet
AVERAGE CHARACTERISTICS	47 V	Published datasheet
HEATER WARM- UP TIME* I	1 s	Published datasheet
CU P.RE NT OPERATION A u	5030 mA	Published datasheet
OC COMPONENT	900 V	Published datasheet

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TOTAL DC AND PEAK	3 V	Published datasheet
DESIGN MAXIMUM VALUES - SEE EIA STANDARD RS	9 mA	Published datasheet
PLATE DISSIPATION	5.3 W	Published datasheet
DC OUTPUT	165 mA	Published datasheet
I _b =	32 V	Published datasheet
E _f =	16 V	Published datasheet

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
STEADY -STATE PEAK PLATE CURRENT	1000 mA	Published datasheet
OF THE VOLTAGE PULSE MUST NOT EXL EE0	154 V	Published datasheet


SOURCE DATA APPENDIX

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
Heater Warmup Time	11 s	—


SOURCE DATA APPENDIX

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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage nominal	16.8 V	—
Warm-up time	11 s	Average
Heater current	450 mA	—
Peak inverse plate voltage	5000 V	DamperService
Peak plate current	1000 mA	DamperService
DC plate current	165 mA	DamperService
Plate dissipation	5.3 W	DamperService
Heater voltage	16.8 V	Reference sheet; AC or DC at rated heater current
Heater current	450 mA	Reference sheet nominal current

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Tube voltage drop at 250 mA	32 V	DamperService



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1975 RCA RC30

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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak inverse plate voltage	5000 V	DamperService
Peak plate current	1000 mA	DamperService
Average plate current	165 mA	DamperService
Plate dissipation	5.3 W	DamperService

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Tube voltage drop	32 V	PlateCurrent=250mA
Heater warm-up time	11 s	Average

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate-to-cathode/heater capacitance	5.5 pF	Approximate
Cathode-to-plate/heater capacitance	7.5 pF	Approximate
Heater-to-cathode capacitance	2.8 pF	Approximate

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