



ELECTRONIC TUBE REFERENCE

12GB3

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

BEAMPOWER

High-pervance beam pentode for television horizontal-deflection output, combining high transconductance with the current capability required for pulsed CRT sweep service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	B5-187	BASE PINS	5
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Beam Power	
PLATE RESISTANCE	53000 Ω
TRANSCONDUCTANCE	0.014 S
MAXIMUM PLATE VOLTAGE	550 V
MAXIMUM SCREEN VOLTAGE	200 V
MAXIMUM PLATE DISSIPATION	10 W
MAXIMUM SCREEN DISSIPATION	5 W
MAXIMUM CATHODE CURRENT	150 mA

12GB3 — High-Perviance Beam Power Tube

An indirectly heated beam pentode designed for use as a horizontal deflection output amplifier in transformer-less television receivers.

Overview

The **12GB3** (also designated as **12G-B3**) is a high-perviance beam pentode housed in a glass envelope with an octal base and a top cap. It is specifically engineered to serve as a horizontal deflection output amplifier in transformer-less television receivers. The tube features a controlled heater warm-up time and is rated for high peak pulse plate voltages, making it suitable for the demanding requirements of television horizontal scanning circuits.

Construction, Physical Dimensions, and Heater

The 12GB3 is constructed using a **T9 glass bulb** and is equipped with a **B5-187 Octal base** and a **C1-2 Skirted Miniature top cap** for the plate connection. This physical configuration isolates the high-voltage anode from the base pins, reducing the risk of arcing. The tube can be mounted in **any position**.

Physical Dimensions

- **Maximum overall length:** 4-11/32 inches
- **Seated height:** 3-7/8 to 3-29/32 inches
- **Maximum bulb diameter:** 1-9/32 inches
- **Top cap diameter:** 13/16 inches (maximum)

Heater Characteristics

The heater is designed for series-string or parallel operation in transformer-less receivers, featuring a controlled warm-up time to minimize voltage stress across heaters in series strings during start-up.

Heater Parameter	Value
Heater Voltage	12.6 V
Heater Current	0.6 A
Heater Warm-up Time	11 seconds
Heating Method	Indirect

Pinout and Electrode Connections

The 12GB3 utilizes an octal base with the plate connected to the top cap. The bottom view of the base reveals the following pin assignments:

Pin Number	Connection	Description
Pin 1	IC	Internal Connection (do not use)
Pin 2	H	Heater

Pin Number	Connection	Description
Pin 3	IC	Internal Connection (do not use)
Pin 4	<u>G2</u>	Grid No. 2 (Screen Grid)
Pin 5	G1	Grid No. 1 (Control Grid)
Pin 6	—	No Connection
Pin 7	H	Heater
Pin 8	K, G3	Cathode and Grid No. 3 (Suppressor Grid)
Top Cap	P	Plate (Anode)

Note: Pins 1 and 3 are designated as Internal Connections (IC) and should not be used for circuit tie points.

Electrical Characteristics and Typical Operation

The 12GB3 exhibits high transconductance and high plate current at low plate voltages, which are characteristic of high-perviance deflection tubes. The manufacturer documents two typical operating points:

Parameter	Operating Point A	Operating Point B
Plate Voltage	40 V	100 V
Grid No. 2 (Screen) Voltage	100 V	100 V
Grid No. 1 (Control) Voltage	0 V	-7.7 V
Plate Current	240 mA	100 mA
Grid No. 2 Current	19 mA	7 mA
Transconductance	—	14,000 μS
Plate Resistance (Approx.)	—	5.3 k Ω

At Operating Point A (where the control grid bias is 0 V and plate voltage is only 40 V), the tube conducts a high plate current of 240 mA, demonstrating its high-perviance design. At Operating Point B, with a plate voltage of 100 V and a negative grid bias of -7.7 V, the transconductance is 14,000 μS (micromhos) and the plate resistance is approximately 5.3 k Ω .

Maximum Ratings

The maximum ratings for the 12GB3 are specified under the **Design Center** system. These ratings are established for operation in a **525-line, 30-frame television system**.

Rating Parameter	Limit Value
D.C. Plate Voltage	550 V
Peak Pulse Plate Voltage (Positive)	+6,600 V
Peak Pulse Plate Voltage (Negative)	-1,500 V
Grid No. 2 (Screen) Voltage	200 V
Peak Negative Grid No. 1 Voltage	-1,000 V
Plate Dissipation	10 W
Grid No. 2 Dissipation	5 W
Total Cathode Current	150 mA
Grid No. 1 Circuit Resistance	2.2 MΩ

Pulse and Heater-Cathode Limits

- **Peak Pulse Plate Voltage Duration:** The positive peak pulse plate voltage rating of +6,600 V is restricted to pulse durations not exceeding 15% of one horizontal scanning cycle. Under no circumstances should this absolute value be exceeded.
- **Heater-Cathode Voltage (Heater Negative):** 200 V maximum.
- **Heater-Cathode Voltage (Heater Positive):** 200 V maximum, with the D.C. component restricted to a maximum of 100 V.

Average Plate Characteristics

The average plate characteristics of the 12GB3 are graphically represented at a heater voltage (E_f) of 12.6 V and a screen grid voltage (E_{c2}) of 170 V. This screen voltage is higher than the 100 V used in the typical operating points, resulting in higher plate current curves.

The curves illustrate plate current (I_b) in milliamperes plotted against plate voltage (V) up to 250 V, for various control grid voltages ($E_{c1}(/tubes/C1)$):

- At $E_{c1}(/tubes/C1) = 0$ V, the plate current rises rapidly, exceeding 500 mA at a plate voltage of approximately 50 V, and leveling off near 550 mA as plate voltage increases to 250 V.
- As the control grid is biased more negatively ($E_{c1}(/tubes/C1) = -1$ V, -5 V, -10 V, -15 V, -20 V, -25 V), the plate current curves shift downward. For example, at $E_{c1}(/tubes/C1) = -25$ V, the plate current remains below 50 mA across the entire plate voltage range shown.

- The sharp knee in the low-voltage region of the curves is characteristic of a high-perviance beam power tube, allowing the tube to operate efficiently with minimal plate-to-cathode voltage drop during the conduction cycle.

Technical Summary

The **12GB3** is an octal-based, high-perviance beam pentode designed for horizontal deflection output service in transformer-less television receivers. It features a **12.6 V, 0.6 A heater** with an 11-second warm-up time, a **T9 bulb**, and a **C1-2 Skirted Miniature top cap** for the anode. The tube is characterized by a high transconductance of **14,000 μS** and a low plate resistance of **5.3 k Ω** under typical operating conditions. It is rated to withstand positive peak plate pulses up to **+6,600 V** and negative pulses up to **-1,500 V** in standard 525-line, 30-frame scanning systems, provided the pulse duration does not exceed 15% of the horizontal cycle.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Hitachi

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

1963 HITACHI

Section 1 · Beam Power

CAPACITANCE

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Interelectrode capacitances published	1	See source table

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warm-up Time	11 s	—