



ELECTRONIC TUBE REFERENCE

12GE5

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

BEAMPOWER

Duodecar beam-power horizontal-output tube for CRT line-deflection service, with approximately 17.5 W plate dissipation and 6.5 kV positive pulse capability.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12BJ	BASE PINS	12
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

12BJ - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	H – Heater	CONNECTED
PIN2	–	G2 – Screen Grid	CONNECTED
PIN3	–	G1 – Control Grid	CONNECTED
PIN4	–	G3 – Suppressor Grid	CONNECTED
PIN4	–	K – Cathode	CONNECTED
PIN5	–	–	IC
PIN6	–	–	IC
PIN7	–	P – Plate (Anode)	CONNECTED
PIN8	–	–	IC
PIN9	–	–	IC
PIN10	–	G3 – Suppressor Grid	CONNECTED
PIN10	–	K – Cathode	CONNECTED
PIN11	–	G1 – Control Grid	CONNECTED

TERMINAL	SECTION	ELEMENT	STATUS
PIN12	—	H — Heater	CONNECTED

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	20000 Ω
TRANSCONDUCTANCE	0.0066 S
AMPLIFICATION FACTOR	4.1
MAXIMUM PLATE VOLTAGE	770 V
MAXIMUM SCREEN VOLTAGE	220 V
MAXIMUM PLATE DISSIPATION	17.5 W
MAXIMUM SCREEN DISSIPATION	3.5 W
MAXIMUM CATHODE CURRENT	175 mA
Sparse-source exception	

12GE5 — Beam Power Compactron

An indirectly heated beam power pentode in a compactron envelope, designed primarily for horizontal-deflection amplifier service in television receivers.

Overview

The **12GE5** is a high-performance beam power pentode designed in the compactron configuration. It is primarily intended for service as a horizontal-deflection amplifier in television receivers operating under 525-line, 30-frame scanning systems.

The 12GE5 features a coated unipotential cathode and is electrically identical to the **6GE5** and **17GE5** vacuum tubes, with the sole exception of its heater characteristics and warm-up time. It is housed in a T-12 glass envelope and utilizes a standard 12-pin duodecar base, which requires a duodecar 12-contact socket.

Physical Construction and Basing

The 12GE5 is constructed using the compactron T-12 design, which provides a compact and mechanically robust structure. The tube can be mounted in any position.

The physical dimensions of the envelope are as follows:

- **Maximum Diameter:** 1.563 inches
- **Maximum Seated Height:** 2.500 inches

- **Maximum Overall Height:** 2.875 inches

Pinout and Basing Diagram

The tube uses the **12BJ** JEDEC basing diagram with a 12-pin button base (E12-74 outline). The pin connections, viewed from the bottom of the tube, are:

Pin	Connection
1	Heater
2	Grid No. 2 (Screen Grid)
3	Grid No. 1 (Control Grid)
4	Cathode & Grid No. 3 (Beam Plates)
5	Internal Connection (Do Not Use)
6	Internal Connection (Do Not Use)
7	Plate
8	Internal Connection (Do Not Use)
9	Internal Connection (Do Not Use)
10	Cathode & Grid No. 3 (Beam Plates)
11	Grid No. 1 (Control Grid)
12	Heater

Pins designated as "Internal Connection" (IC) should not be used for circuit connections.

Heater Characteristics and Ratings

The 12GE5 is designed for series-string heater circuits or parallel operation, with controlled warm-up characteristics to minimize voltage surges in series-connected receiver designs.

Parameter	Value
Nominal Heater Voltage (AC/DC)	12.5 to 12.6 V
Nominal Heater Current	0.6 A (600 mA)
Heater Current Limits	0.6 ± 0.04 A (600 ± 40 mA)
Average Heater Warm-up Time	11 seconds

Heater Warm-up Time Definition

The average heater warm-up time of 11 seconds is defined under specific test conditions. It represents the time required for the voltage across the heater to reach 80% of its rated value when four times the rated heater voltage is applied to a circuit consisting of the tube heater in series with an external resistance. This series resistance must equal three times the nominal heater operating resistance at its normal operating temperature.

Heater-Cathode Voltage Limits

To prevent insulation breakdown and hum injection, the voltage between the heater and cathode must be kept within the following design-maximum limits:

- **Heater Positive with Respect to Cathode:**
 - DC Component: 100 V maximum
 - Total DC and Peak: 200 V maximum
- **Heater Negative with Respect to Cathode:**
 - Total DC and Peak: 200 V maximum
- **General Limits:** Peak value of ± 200 V maximum, with an average value of 100 V maximum.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12GE5, measured without an external shield, are approximately:

- **Grid No. 1 to Plate (G1 to P):** 0.34 pF
- **Input (G1 to H + K + G2 + B.P.):** 16 pF
- **Output (P to H + K + G2 + B.P.):** 7.0 pF

(Note: B.P. represents the beam plates / Grid No. 3).

Typical Operating Characteristics (Class A1)

The 12GE5 can be operated as either a pentode or a triode (with Grid No. 2 tied to the plate). The typical characteristics at standard operating points are detailed below:

Pentode Connection

Under typical Class A1 conditions, the tube exhibits the following characteristics:

Parameter	Low-Voltage Knee Point	Standard Operating Point
Plate Voltage	60 V	250 V
Grid No. 2 (Screen Grid) Voltage	150 V	150 V

Parameter	Low-Voltage Knee Point	Standard Operating Point
Grid No. 1 (Control Grid) Voltage	0 V	-22.5 V
Plate Resistance (Approx.)	—	18,000 to 20,000 Ω
Transconductance	—	6,600 to 7,300 μmhos
Plate Current	345 mA	55 to 75 mA
Grid No. 2 Current	27 to 33 mA	1.8 to 2.4 mA
Grid No. 1 Voltage for $I_b = 1.0 \text{ mA}$ (Approx.)	—	-42 to -46 V

At an elevated plate voltage of 5000 V (with Grid No. 2 at 150 V), the control-grid voltage required to reduce the plate current to approximately 1.0 mA is -100 V.

Triode Connection

When Grid No. 2 is connected directly to the plate, the 12GE5 operates as a triode with the following characteristics:

- **Plate Voltage:** 150 V
- **Grid No. 2 Voltage:** 150 V
- **Grid No. 1 Voltage:** -22.5 V
- **Amplification Factor (μ):** 4.4

Horizontal-Deflection Amplifier Ratings

Because the 12GE5 is designed for the demanding pulse-service environment of television horizontal-deflection circuits, its ratings are established under the Design-Maximum System.

Rating Parameter	Design-Maximum Value
DC Plate Supply Voltage (Boost + DC Power Supply)	770 V
Peak Positive-Pulse Plate Voltage	6500 V
Peak Negative-Pulse Plate Voltage	1500 V
DC Grid No. 2 (Screen-Grid) Voltage	220 V
DC Grid No. 1 (Control-Grid) Voltage	-55 V
Peak Negative-Pulse Grid No. 1 Voltage	330 V
Peak Cathode Current	550 mA

Rating Parameter	Design-Maximum Value
Average Cathode Current	175 mA
Plate Dissipation	17.5 W
Grid No. 2 Input	3.5 W
Bulb Temperature (at hottest point)	220 °C
Maximum Grid No. 1 Circuit Resistance	1.0 MΩ

Operating Precautions and Pulse Limits

- **Pulse Duration:** The peak positive-pulse plate voltage rating of 6500 V is an absolute maximum value. It is restricted to a maximum pulse duration of 15% of a horizontal scanning cycle, which corresponds to 10 microseconds in a standard 525-line, 30-frame television system.
- **Tube Protection:** In stages operating with grid-leak bias, an adequate cathode-bias resistor or other protective means must be incorporated in the circuit design. This protects the tube from excessive current and potential damage in the event that excitation (drive signal) is lost.

Related Designations

The **12GE5** is part of a family of identical-structure beam power tubes designed for different heater supply systems:

- **6GE5:** Designed for standard parallel heater operation with a **6.3 V, 1.2 A** heater.
- **17GE5:** Designed for series-string heater operation with a **15.8 to 16.8 V, 0.45 A** heater.

These three tubes share identical physical dimensions, basing configurations, and electrical ratings, differing only in their heater requirements and warm-up times.

Technical Summary

The **12GE5** is a **12-pin compactron beam power pentode** designed specifically for **horizontal-deflection amplifier service** in television receivers. It operates with a **12.5 to 12.6 V, 0.6 A** heater featuring a controlled **11-second warm-up time** for series-string applications.

The tube is capable of handling high peak positive-pulse plate voltages up to **6500 V** (with a 15% duty cycle limit) and has a maximum plate dissipation rating of **17.5 W**. In typical Class A1 pentode operation, it provides a transconductance of **6,600 to 7,300 μmhos** and a plate resistance of **18,000 to 20,000 Ω**. The 12GE5 offers a robust, high-voltage switching capability in a compact T-12 glass envelope, making it a highly specialized component for television sweep circuits.



SOURCE OPERATING CONDITIONS

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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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	—
Heater current	600 mA	—
Peak positive plate voltage	6500 V	HorizontalDeflection
Peak cathode current	550 mA	HorizontalDeflection

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	16 pF	—



SOURCE OPERATING CONDITIONS

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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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DC plate-supply voltage	770 V	HorizontalDeflection
Peak positive pulse plate voltage	6500 V	HorizontalDeflection
Peak negative pulse plate voltage	-1500 V	HorizontalDeflection

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #2 voltage maximum	220 V	HorizontalDeflection
Peak negative grid #1 voltage	-330 V	HorizontalDeflection
Peak cathode current	550 mA	HorizontalDeflection
Average cathode current	175 mA	HorizontalDeflection
Plate voltage	250 V	AverageCharacteristics
Grid #2 voltage	150 V	AverageCharacteristics
Grid #1 voltage	-22.5 V	AverageCharacteristics
Plate current	75 mA	AverageCharacteristics
Grid #2 current	2.4 mA	AverageCharacteristics
Heater warm-up time	11 s	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	20000 ohm	AverageCharacteristics
Transconductance	6600 uS	AverageCharacteristics
Triode amplification factor	4.1	TriodeConnection

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #1-to-plate capacitance	0.34 pF	—
Input capacitance	16 pF	—
Output capacitance	7 pF	—


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1971 RCA HB3 Binder 5 of 7

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OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	—
Heater current	600 mA	—
Maximum DC plate voltage	770 V	HorizontalDeflection
Peak positive-pulse plate voltage	6500 V	HorizontalDeflection
Maximum screen voltage	220 V	HorizontalDeflection
Average cathode current	175 mA	HorizontalDeflection
Plate dissipation	17.5 W	—
Heater warm-up time	11 s	ControlledWarmup

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA
Screen voltage	150 V	ClassA
Plate current	70 mA	ClassA
Plate resistance	18000 ohm	ClassA
Transconductance	7300 uS	ClassA

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	0.26 pF	—



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.

1975 RCA RC30

Section 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Load Resistance 2000	4000 Ω	Published in approved 17GE5 target datasheet entry; Section1
Total Harmonic Distortion 10	10 %	Published in approved 17GE5 target datasheet entry; Section1
Maximum-Signal Power Output 2.1	3.8 W	Published in approved 17GE5 target datasheet entry; Section1
For fixed -bias operation	0.1 MΩ	Published in approved 17GE5 target datasheet entry; Section1
For cathode-bias operation	0.5 MΩ	Published in approved 17GE5 target datasheet entry; Section1
Heater Voltage (ac/dc) 6.3 12.6	16.8 V	Published in approved 17GE5 target datasheet entry; Section1
Heater Current 1.2 0.6	450 mA	Published in approved 17GE5 target datasheet entry; Section1
Heater Warm-up Time (Average) – 11	11 seconds	Published in approved 17GE5 target datasheet entry; Section1
DC Plate Supply Voltage	770 V	Published in approved 17GE5 target datasheet entry; Section1
Peak Positive-Pulse Plate Voltage*	6500 V	Published in approved 17GE5 target datasheet entry; Section1
Peak Negative-Pulse Plate Voltage	1500 V	Published in approved 17GE5 target datasheet entry; Section1
DC Grid-No.2 Voltage	220 V	Published in approved 17GE5 target datasheet entry; Section1
Peak Negative-Pulse Grid-No.1 Voltage	330 V	Published in approved 17GE5 target datasheet entry; Section1
3	-6 W	Published in approved 17GE5 target datasheet entry; Section1
Grid-No.1 Circuit Resistance	1 MΩ	Published in approved 17GE5 target datasheet entry; Section1
# Pulse duration must not exceed 15% of a horizontal scanning cycle (	10 microseconds	Published in approved 17GE5 target datasheet entry; Section1
Heater Voltage (ac/dc) 6.3 9.7	13 V	Published in approved 17GE5 target datasheet entry; Section1
Heater Current 0.985 0.6	450 mA	Published in approved 17GE5 target datasheet entry; Section1

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage 60 250	150 V	Published in approved 17GE5 target datasheet entry; Section1
Grid-No.2 (Screen-Grid) Voltage 150 150	150 V	Published in approved 17GE5 target datasheet entry; Section1
Grid-No.1 (Control-Grid) Voltage 0	-22.5 V	Published in approved 17GE5 target datasheet entry; Section1
Plate Resistance (Approx.)	18000 Ω	Published in approved 17GE5 target datasheet entry; Section1
Transconductance	7300 μS	Published in approved 17GE5 target datasheet entry; Section1
Plate Current 345*	65 mA	Published in approved 17GE5 target datasheet entry; Section1
Grid-No.2 Current 27 •	1.8 mA	Published in approved 17GE5 target datasheet entry; Section1
of	1 mA	Published in approved 17GE5 target datasheet entry; Section1
of 1 mA	-42 V	Published in approved 17GE5 target datasheet entry; Section1
Grid to Plate 4.6	9 pF	Published in approved 17GE5 target datasheet entry; Section1
Plate Voltage 250	150 V	Published in approved 17GE5 target datasheet entry; Section1
Grid Voltage -3	-20 V	Published in approved 17GE5 target datasheet entry; Section1
Plate Resistance (Approx.) 40000	760 Ω	Published in approved 17GE5 target datasheet entry; Section1
Transconductance 1600	7200 μS	Published in approved 17GE5 target datasheet entry; Section1
For plate current of 100 /lA –	-45 V	Published in approved 17GE5 target datasheet entry; Section1
For plate voltage of	60 V	Published in approved 17GE5 target datasheet entry; Section1
For plate voltage of 60 volts and zero grid voltage	95 mA	Published in approved 17GE5 target datasheet entry; Section1
For grid voltage of	28 V	Published in approved 17GE5 target datasheet entry; Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Cathode and Heater 2.4	6.5 pF	Published in approved 17GE5 target datasheet entry; Section1
Plate to Cathode and Heater 0.26	1.4 pF	Published in approved 17GE5 target datasheet entry; Section1

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