

ELECTRONIC TUBE REFERENCE

12GW6

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

High-current glass-octal beam-power tube specifically designed for television horizontal-deflection output, with strong positive and negative pulse-voltage ratings.

GENERAL CHARACTERISTICS

BASE DESIGNATION	6AM	BASE PINS	7
NOMINAL HEATER	12.6 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

6AM - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – Pin 1	–	–	NC · verified
PIN2 – Pin 2	–	H – Heater	CONNECTED · verified
PIN3 – Pin 3	–	–	NC · verified
PIN4 – Pin 4	A	G2 – Screen Grid	CONNECTED · verified
PIN5 – Pin 5	A	G1 – Control Grid	CONNECTED · verified
PIN7 – Pin 7	–	H – Heater	CONNECTED · verified
PIN8 – Pin 8	A	BP – Beam-Forming Plate	CONNECTED · verified
PIN8 – Pin 8	A	K – Cathode	CONNECTED · verified

TERMINAL	SECTION	ELEMENT	STATUS
CAP1 – Top cap	A	P – Plate (Anode)	CONNECTED • verified

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	15000 Ω
TRANSCONDUCTANCE	0.0071 S
AMPLIFICATION FACTOR	4.4
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
<i>Published Westinghouse ratings, characteristics, capacitances, pulse/deflection data, and typical operating conditions promoted where applicable; additional values retained as parameters.</i>	

12GW6 — Beam Power Pentode

An octal-based beam power pentode designed for service as a horizontal-deflection output amplifier in television receivers, featuring high efficiency, controlled heater warm-up, and high peak current capabilities.

Overview

The **12GW6** is a glass-octal beam power pentode engineered primarily for use as a horizontal-deflection amplifier in high-efficiency deflection circuits of television receivers. It is designed to operate effectively in circuits with low plate supply voltages and is characterized by high zero-bias plate current, a high ratio of plate current to screen-grid (grid No. 2) current, and high DC plate supply voltage ratings.

The 12GW6 is electrically identical to the [6GW6](#) (or [6GW6/6DQ6B](#)) and the [17GW6](#) (or [17GW6/17DQ6B](#)) except for its heater ratings. It is frequently co-designated as the **12GW6/12DQ6B** or **12DQ6B/12GW6**, representing its dual-standard nomenclature.

Heater Characteristics and Series-String Operation

The 12GW6 features an indirectly heated, coated unipotential cathode. It is specifically designed for use in television receivers employing series-connected heater strings, where the picture-tube heater and other

tube heaters are wired in series. To minimize heater voltage surges across individual tubes during startup, the 12GW6 incorporates a controlled heater warm-up characteristic.

Heater Parameter	Value
Nominal Heater Voltage (AC or DC)	12.6 V
Nominal Heater Current	0.60 A (600 mA)
Heater Current Tolerance	±6% (or ±0.040 A)
Average Heater Warm-up Time	11 seconds

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four times the rated heater voltage to a circuit consisting of the tube heater in series with an external resistance equal to three times the nominal heater operating resistance.

Heater-to-cathode voltage limits are strictly defined to prevent insulation breakdown:

- **Heater Negative with Respect to Cathode:** The maximum allowable total DC and peak voltage is **200 V**.
- **Heater Positive with Respect to Cathode:** The maximum allowable total DC and peak voltage is **200 V**, with the DC component restricted to a maximum of **100 V**.

Mechanical Design, Basing, and Pinout

The 12GW6 is constructed in a T-12 glass envelope with a short medium shell octal base. Depending on the manufacturer and specific base style (such as JEDEC B6-122, B5-190, B6-148, B7-111, or B7-119), the base may feature 5, 6, or 7 pins. When the B5-190 base style is utilized, pin number 3 is omitted. The tube features a skirted miniature top cap (JEDEC C1-2 or C1-3) for the high-voltage plate connection, which isolates the high-pulse plate voltage from the other base pins.

The tube utilizes the JEDEC **6AM** basing diagram. The pin connections, viewed from the bottom of the base, are as follows:

Pin Number	Connection
Pin 1	No Connection (NC)
Pin 2	Heater
Pin 3	No Connection (NC) (Omitted on B5-190 base)
Pin 4	Grid No. 2 (Screen Grid)
Pin 5	Grid No. 1 (Control Grid)
Pin 7	Heater
Pin 8	Cathode & Grid No. 3 (Beam Plates)

Pin Number	Connection
Top Cap	Plate (Anode)

The physical dimensions of the envelope are:

- **Maximum Diameter:** 1.563 inches
- **Maximum Seated Height:** 3.688 inches
- **Maximum Overall Height:** 4.250 inches

The 12GW6 can be mounted and operated in **any position**.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12GW6 are measured without an external shield. The typical values are:

- **Grid No. 1 to Plate:** 0.5 pF (up to 0.6 pF in some specifications)
- **Input (Grid No. 1 to Cathode, Heater, Grid No. 2, and Grid No. 3):** 15.0 pF to 17 pF
- **Output (Plate to Cathode, Heater, Grid No. 2, and Grid No. 3):** 7.0 pF

Electrical Characteristics and Operating Points

The 12GW6 can be evaluated under Class A1 amplifier conditions. The published technical literature documents two distinct sets of typical operating characteristics, reflecting different application requirements (such as standard deflection versus high-performance or color television deflection service).

Standard Operating Point

Under standard operating conditions, the tube exhibits the following characteristics:

Parameter	Pentode Connection	Triode Connection
Plate Voltage	250 V	150 V
Grid No. 2 Voltage	150 V	Connected to Plate (150 V)
Grid No. 1 Voltage	-22.5 V	-22.5 V
Plate Current	65 mA to 70 mA	—
Grid No. 2 Current	1.8 mA to 2.1 mA	—
Transconductance	7100 μ mhos to 7300 μ mhos	—
Plate Resistance (Approx.)	15,000 to 18,000 Ω	—
Amplification Factor (Grid No. 2 to Grid No. 1)	—	4.4

Parameter	Pentode Connection	Triode Connection
Grid No. 1 Cutoff Voltage (for plate current of 1 mA)	-42 V (approx.)	—

High-Performance Operating Point

For higher-power deflection applications, Sylvania documents an alternative operating point with significantly higher transconductance and current capability:

- **Plate Voltage:** 175 V
- **Grid No. 2 Voltage:** 125 V
- **Grid No. 1 Voltage:** -25 V
- **Plate Current:** 110 mA
- **Grid No. 2 Current:** 5 mA
- **Transconductance:** 10,500 μmhos
- **Plate Resistance (Approx.):** 5500 Ω
- **Amplification Factor (Triode-connected):** 3.3
- **Grid No. 1 Cutoff Voltage (for plate current of 1 mA):** -75 V

Zero-Bias and Knee Characteristics

The 12GW6 is designed to achieve high plate current at the "knee" of its characteristic curve when the control grid is at zero bias. This is critical for sweeping the electron beam across the television screen efficiently.

- **At $E_b = 60\text{ V}$, $E_{c2} = 150\text{ V}$, $E_{c1} = 0\text{ V}$:** The instantaneous plate current reaches **345 mA to 390 mA**, while the grid No. 2 current is **27 mA to 32 mA**.
- **At $E_b = 70\text{ V}$, $E_{c2} = 125\text{ V}$, $E_{c1} = 0\text{ V}$:** The instantaneous plate current reaches **550 mA**, while the grid No. 2 current is **42 mA**.

Note on Measurement: Because operating the tube at zero bias with continuous DC voltages would quickly exceed the maximum plate and screen-grid dissipation ratings, these knee values must be measured using a recurrent waveform method (or restricted to a short interval of no more than 2 seconds) to prevent permanent damage to the tube.

Horizontal-Deflection Amplifier Ratings and Circuit Requirements

The maximum ratings of the 12GW6 are specified under the Design-Maximum Rating System. Depending on the target application (such as standard black-and-white receivers versus high-demand color television receivers), two distinct sets of maximum ratings are documented.

Rating Parameter	Standard Deflection Service	High-Performance / Color TV Service
DC Plate Supply Voltage (Boost + DC Supply)	770 V max	900 V max
Peak Positive-Pulse Plate Voltage	6500 V max	7000 V max
Peak Negative-Pulse Plate Voltage	1500 V max	1500 V max
DC Grid No. 2 (Screen Grid) Voltage	220 V max	175 V max
DC Grid No. 1 (Control Grid) Voltage	-55 V max	—
Peak Negative-Pulse Grid No. 1 Voltage	330 V max	200 V max
Plate Dissipation	17.5 W to 18 W max	24 W max
Grid No. 2 Input / Dissipation	3.5 W to 3.6 W max	3.2 W max
Average Cathode Current	175 mA max	285 mA max
Peak Cathode Current	550 mA to 610 mA max	1000 mA max
Grid No. 1 Circuit Resistance (Grid-Resistor Bias)	1.0 MΩ max	0.47 MΩ max
Bulb Temperature (at hottest point)	220 °C to 240 °C max	240 °C max

Pulse Rating Conditions

The peak pulse ratings (such as the 6500 V or 7000 V peak positive plate voltage) are specialized limits intended for horizontal deflection service in a standard 525-line, 30-frame television system. The duty cycle of these pulses must not exceed **15% of one horizontal scanning cycle** (which corresponds to a maximum pulse duration of **10 microseconds**).

Circuit Protection

When the 12GW6 is operated in stages utilizing grid-resistor bias (or grid-leak bias), the circuit must incorporate an adequate cathode-bias resistor or other protective means. This precaution is mandatory to protect the tube from excessive current and thermal runaway in the event that the horizontal excitation signal is lost.

Technical Summary

The **12GW6** is a robust, glass-octal beam power pentode designed specifically for horizontal-deflection amplifier service in television receivers. Featuring a **12.6 V, 0.6 A** heater with a controlled 11-second warm-up time, it is optimized for series-connected heater strings. The tube's design provides high peak cathode currents (up to 1000 mA under pulsed conditions) and high plate dissipation capabilities (up to 24 W in high-performance applications), making it highly efficient in driving deflection coils. With its isolated top-cap plate connection and standard JEDEC 6AM basing, the 12GW6 remains a classic example of specialized television sweep-tube engineering.



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 · 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	17 pF	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Westinghouse Data Book

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

1965 WESTINGHOUSE DATA BOOK

Section 1 · Beam Power

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

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate dissipation maximum	17.5 W	—
DC grid2 voltage maximum	220 V	—
Grid2 dissipation maximum	3.5 W	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	7100 uS	—
Triode-connected amplification factor	4.4	TriodeConnection

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Horizontal-deflection output amplifier	—


SOURCE DATA APPENDIX

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 · 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
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

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #2 voltage	150 V	AverageCharacteristics
Grid #1 voltage	-22.5 V	AverageCharacteristics
Plate current	70 mA	AverageCharacteristics
Grid #2 current	2.1 mA	AverageCharacteristics
Heater warm-up time	11 s	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	15000 ohm	AverageCharacteristics
Transconductance	7100 uS	AverageCharacteristics
Triode amplification factor	4.4	TriodeConnection

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid #1-to-plate capacitance	0.5 pF	—
Input capacitance	17 pF	—
Output capacitance	7 pF	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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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

Section 1 · Beam Power

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

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average cathode current	175 mA	HorizontalDeflection
Plate dissipation	18 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	17000 ohm	ClassA
Transconductance	7500 uS	ClassA

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



SOURCE DATA APPENDIX

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
Maximum pulse duration	200 microseconds	Published in approved 17DQ6B target datasheet entry; Section1
be reduced to 100 mAwith a maximum pulse duration of	400 microseconds	Published in approved 17DQ6B target datasheet entry; Section1
Heater Voltage (ac/dc) 6.3 12.6	16.8 V	Published in approved 17DQ6B target datasheet entry; Section1
Heater Current 1.2 0.6	450 mA	Published in approved 17DQ6B target datasheet entry; Section1
Heater Warm-up Time (Average) 11	11 seconds	Published in approved 17DQ6B target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DC Plate Supply Voltage	770 V	Published in approved 17DQ6B target datasheet entry; Section1
Peak Positive-Pulse Plate Voltage*	6500 V	Published in approved 17DQ6B target datasheet entry; Section1
Peak Negative-Pulse Plate Voltage	1500 V	Published in approved 17DQ6B target datasheet entry; Section1
DC Grid-No.2 (Screen-Grid) Voltage	220 V	Published in approved 17DQ6B target datasheet entry; Section1
DC Grid-No.1 (Control-Grid) Voltage	55 V	Published in approved 17DQ6B target datasheet entry; Section1
Peak Negative-Pulse Grid-No.1 Voltage	330 V	Published in approved 17DQ6B target datasheet entry; Section1
Peak Cathode Current	550 mA	Published in approved 17DQ6B target datasheet entry; Section1
Average Cathode Current	175 mA	Published in approved 17DQ6B target datasheet entry; Section1
Plate Dissipation*	17.5 W	Published in approved 17DQ6B target datasheet entry; Section1
Grid-No.2 Input	3.5 W	Published in approved 17DQ6B target datasheet entry; Section1
Bulb Temperature (At hottest point)	240 °C	Published in approved 17DQ6B target datasheet entry; Section1
Grid-No. 1-Circuit Resistance, for grid-resistor-bias operation	1 MΩ	Published in approved 17DQ6B target datasheet entry; Section1
# Pulse duration must not exceed 15% of a horizontal scanning cycle (	10 microseconds	Published in approved 17DQ6B target datasheet entry; Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No	3 pF	Published in approved 17DQ6B target datasheet entry; Section1

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage 150 60	250 V	Published in approved 17DQ6B target datasheet entry; Section1
C.rid-No.2 Voltage 150 150	150 V	Published in approved 17DQ6B target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-No. 1 Voltage -22.5 V	-22.5 V	Published in approved 17DQ6B target datasheet entry; Section1
Plate Resistance (Approx.)	$15000 \text{ }\Omega$	Published in approved 17DQ6B target datasheet entry; Section1
Grid-No.2 Current $32 \text{ }\mu\text{A}$	2.1 mA	Published in approved 17DQ6B target datasheet entry; Section1
1 mA	-42 V	Published in approved 17DQ6B target datasheet entry; Section1

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