



ELECTRONIC TUBE REFERENCE

12DQ6

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

BEAMPOWER

Heavy-duty beam-power pentode specifically designed for television horizontal-deflection output, with approximately 15 W plate dissipation and multi-kilovolt flyback pulse capability.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	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

SECTION RATINGS

SECTION 1 Beam Power	
PLATE RESISTANCE	20000 Ω
MAXIMUM PLATE VOLTAGE	700 V
MAXIMUM SCREEN VOLTAGE	175 V
MAXIMUM PLATE DISSIPATION	15 W
MAXIMUM SCREEN DISSIPATION	3.2 W
MAXIMUM CATHODE CURRENT	150 mA
<i>Published Westinghouse ratings, characteristics, capacitances, pulse/deflection data, and typical operating conditions promoted where applicable; additional values retained as parameters.</i>	

12DQ6 — Horizontal Deflection Beam-Power Pentode

The **12DQ6** and its variant, the **12DQ6-A**, are octal-based beam-power pentodes designed primarily for service as output amplifiers in the horizontal deflection circuits of television receivers. These tubes are

engineered to deliver high zero-bias plate current, a high ratio of plate current to grid-2 (screen grid) current, and high DC plate supply voltage capabilities. Combined with a plate dissipation rating of 15 watts, these characteristics make the 12DQ6 family highly effective in demanding television sweep applications.

Series Heater Design and Controlled Warm-Up

The 12DQ6 and 12DQ6-A are specifically optimized for television receivers utilizing series-connected heater strings, where the picture-tube heater and other tube heaters are wired in series. When operated in such configurations alongside other tubes with identical heater current ratings, heater voltage surges across individual tubes during startup are minimized. This protection is achieved through a controlled heater warm-up characteristic.

The heater is designed for either AC or DC operation with the following specifications:

Parameter	Value
Heater Voltage	12.6 V
Heater Current	0.60 A ± 6%
Heater Warm-up Time	11 seconds
Cathode Type	Coated Unipotential

The 11-second warm-up time is defined under specific test conditions: it represents the time required for the voltage across the heater to reach 80% of its rated value (12.6 V) after applying four times the rated heater voltage (50.4 V) to a circuit consisting of the tube heater in series with an external resistance. This series resistance is calculated as three times the rated heater voltage divided by the rated heater current (which calculates to $3 * 12.6 / 0.60 = 63$ ohms).

Mechanical Specifications and Pinout

The 12DQ6 and 12DQ6-A utilize a T-12 glass bulb envelope with a short shell octal base and a skirted miniature top cap (designated C1-3). The tubes can be mounted in any physical position.

Physical Dimensions

- **Maximum Overall Length:** 4-1/4 inches
- **Maximum Seated Height:** 3-11/16 inches
- **Maximum Bulb Diameter:** 1-9/16 inches

Basing Configuration (6AM)

The tube uses the **6AM** basing diagram, which provides the following electrical connections when viewed from the bottom of the base:

- **Pin 1:** No Connection (NC)

- **Pin 2:** Heater (H)
- **Pin 3:** Grid 3 / Suppressor Grid (G3)
- **Pin 4:** Grid 2 / Screen Grid (G2)
- **Pin 5:** Grid 1 / Control Grid (G1)
- **Pin 6:** No Connection (NC)
- **Pin 7:** Heater (H)
- **Pin 8:** Cathode (K)
- **Top Cap:** Plate (P)

Direct Interelectrode Capacitances

These values are measured without an external shield:

- **Grid 1 to Plate:** 0.55 pF
- **Input (G1 to all other electrodes except Plate):** 15.0 pF
- **Output (Plate to all other electrodes except G1):** 7.0 pF

Electrical Characteristics and Typical Operation

The 12DQ6 and 12DQ6-A exhibit high transconductance and low plate resistance under typical pentode operating conditions. The "A" variant features an upgraded design that provides higher transconductance and slightly modified cutoff characteristics.

Pentode Operation (Class A)

At a standard operating point, the typical characteristics of each type are as follows:

Parameter	12DQ6	12DQ6-A
Plate Voltage	250 V	250 V
Grid 2 Voltage	150 V	150 V
Grid 1 Voltage	-22.5 V	-22.5 V
Plate Current	75 mA	75 mA
Grid 2 Current	2.4 mA	2.4 mA
Transconductance	6,000 umhos	6,600 umhos
Plate Resistance	20,000 ohms	20,000 ohms

Zero-Bias Characteristics

Under zero-bias conditions, the tube is capable of conducting high peak currents. To prevent damage, these values must be measured using a recurrent waveform method that keeps plate and grid-2 dissipation within safe limits, or applied only for a short interval not exceeding 2 seconds:

- **Plate Voltage:** 60 V
- **Grid 2 Voltage:** 150 V
- **Plate Current:** 300 mA
- **Grid 2 Current:** 27 mA

Cutoff Characteristics

The control grid voltage required to reduce plate current to 1.0 mA is specified under the following conditions:

- **Plate Voltage:** 250 V
- **Grid 2 Voltage:** 150 V
- **Grid 1 Voltage (Approximate Cutoff):** -50 V (for 12DQ6) / -46 V (for 12DQ6-A)

Triode Amplification Factor

When connected as a triode (with Grid 2 tied to Plate), the amplification factor is:

- **Plate Voltage:** 150 V
- **Grid 2 Voltage:** 150 V
- **Grid 1 Voltage:** -22.5 V
- **Amplification Factor (μ):** 4.1

Maximum Ratings

The maximum ratings are established under the Design Center system. The 12DQ6-A features increased voltage, dissipation, and current ratings compared to the original 12DQ6, allowing for greater safety margins and reliability in television sweep circuits.

Rating	12DQ6	12DQ6-A
D.C. Plate Supply Voltage (Boost + D.C. Power Supply)	550 V max.	700 V max.
Peak Positive Plate Voltage (Absolute Maximum)*	6,000 V max.	6,000 V max.
Peak Negative Pulse Plate Voltage	1,375 V max.	1,375 V max.
Plate Dissipation	15 W max.	15 W max.
Peak Negative Grid 1 Voltage	300 V max.	300 V max.
D.C. Grid 2 Voltage	175 V max.	200 V max.
Grid 2 Dissipation	2.5 W max.	3.0 W max.

Rating	12DQ6	12DQ6-A
Average Cathode Current	120 mA max.	140 mA max.
Peak Cathode Current	440 mA max.	440 mA max.
Grid 1 Circuit Resistance (with grid-leak bias)	0.47 Mohm max.	1.0 Mohm max.
Bulb Temperature (at hottest point)	220 C max.	220 C max.

*Note on Peak Positive Plate Voltage: This absolute maximum rating of 6,000 V is specified for operation in a standard 525-line, 30-frame television system. The duty cycle of the high-voltage pulse must not exceed 15% of the total scanning cycle.

Heater-Cathode Voltage Ratings

Both the 12DQ6 and 12DQ6-A share identical heater-to-cathode voltage limits:

- **Heater Negative with Respect to Cathode (Total DC + Peak):** 200 V max.
- **Heater Positive with Respect to Cathode (DC Component):** 100 V max.
- **Heater Positive with Respect to Cathode (Total DC + Peak):** 200 V max.

Circuit Design Considerations

When designing circuits around the 12DQ6 or 12DQ6-A, specific biasing precautions must be observed. In stages operating with grid-leak bias, the tube is vulnerable to excessive current if the input excitation signal is lost. To prevent catastrophic failure under these conditions, an adequate cathode bias resistor or other suitable protective means must be incorporated into the circuit to limit current to safe levels in the absence of drive.

Additionally, the maximum grid-1 circuit resistance depends on the tube variant. The 12DQ6-A permits a maximum grid-1 circuit resistance of 1.0 Megohm when utilizing grid-leak bias, which is more than double the 0.47 Megohm limit of the original 12DQ6. This allows for greater flexibility in the design of the grid drive circuit.

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
Peak positive plate voltage maximum	6000 V	Pulse
Peak negative pulse plate voltage maximum	-1000 V	Pulse
Average cathode current maximum	150 mA	—
Peak cathode current maximum	500 mA	Pulse
Typical plate voltage	250 V	—
Typical grid2 voltage	150 V	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	6500 μ S	—

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

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