

ELECTRONIC TUBE REFERENCE

12DW5

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

Beam-power pentode designed primarily as a vertical-deflection amplifier in 110-degree television receivers, with ratings suited to the pulsed demands of sweep-output service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9CK	BASE PINS	9
NOMINAL HEATER	12.6 V / 900 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

9CK - TERMINAL PINOUT

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

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	15000 Ω
TRANSCONDUCTANCE	0.0055 S
AMPLIFICATION FACTOR	4.3
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM SCREEN VOLTAGE	220 V
MAXIMUM PLATE DISSIPATION	12 W
MAXIMUM SCREEN DISSIPATION	2.5 W
MAXIMUM CATHODE CURRENT	65 mA
PEAK INVERSE VOLTAGE	6000 V
<i>Published ratings and characteristics promoted from the approved source.</i>	

12DW5 — Beam Power Pentode

The **12DW5** is a miniature beam power pentode designed primarily for vertical deflection amplifier service in television receivers employing 110-degree deflection systems. It is characterized by a high zero-bias plate current and is engineered to operate efficiently at relatively low B supply voltages.

The tube features controlled heater thermal characteristics to minimize heater voltage surges during the warm-up cycle when used in series-string arrangements with other similarly controlled tubes. Except for its heater ratings and heater warm-up time, the 12DW5 is identical to the [6DW5](#).

Construction, Physical Dimensions, and Pinout

The 12DW5 is constructed in a 9-pin miniature glass envelope (T-6 1/2 bulb) with a small button 9-pin base (9CK arrangement). It features a coated unipotential cathode and can be operated in any mounting position.

The physical dimensions of the tube are as follows:

- **Bulb type:** T-6 1/2
- **Maximum overall length:** 3-1/16 inches
- **Maximum seated height:** 2-13/16 inches
- **Maximum diameter:** 7/8 inches

The 9CK base connections, viewed from the bottom of the tube, are assigned as follows:

Pin	Connection
Pin 1	Grid No. 1 (G1)
Pin 2	No Connection (NC)

Pin	Connection
Pin 3	Grid No. 2 (<u>G2</u>)
Pin 4	Heater (H)
Pin 5	Heater (H)
Pin 6	Grid No. 1 (G1)
Pin 7	Grid No. 3 (G3) / Cathode (K)
Pin 8	No Connection (NC)
Pin 9	Plate (P)

Grid No. 1 is internally connected to both Pin 1 and Pin 6. Grid No. 3 (the beam-forming plates) is internally connected to the cathode at Pin 7.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12DW5, measured without an external shield, are:

- **Grid No. 1 to Plate (G1 to P):** 0.5 pF
- **Input (G1 to H+K):** 14 pF
- **Output (P to H+K):** 9 pF

Heater Characteristics and Controlled Warm-up

The 12DW5 heater is designed for operation from either an AC or DC supply. The heater has controlled thermal characteristics specifically designed for series-string television receivers to minimize voltage surges during the initial warm-up phase.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.6 A
Calculated Heater Power	7.56 W
Heater Warm-up Time (Approximate)	11.0 seconds

Heater Warm-up Time Calculation and Definition

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated voltage (which is $12.6 \text{ V} * 0.8 = 10.08 \text{ V}$) after applying four times the rated heater voltage ($4 * 12.6 \text{ V} = 50.4 \text{ V}$) to a test circuit. This test circuit consists of the tube heater connected in series with an external resistance.

The value of this series resistance is calculated as three times the nominal heater operating resistance:

- **Nominal Heater Operating Resistance (Rh):** $12.6 \text{ V} / 0.6 \text{ A} = 21 \text{ ohms}$
- **Series Test Resistance (Rseries):** $3 * 21 \text{ ohms} = 63 \text{ ohms}$

Under these conditions, the heater voltage reaches the 80% threshold in approximately 11.0 seconds.

Electrical Characteristics and Typical Operating Points

The 12DW5 is optimized for high current delivery at low plate voltages, which is essential for driving the magnetic deflection coils in 110-degree television sweep circuits.

Typical Class A Operating Conditions (Pentode Connected)

When operated as a pentode-connected vertical deflection amplifier, the typical operating parameters are:

- **Plate Voltage:** 200 V
- **Grid No. 2 (Screen Grid) Voltage:** 150 V
- **Grid No. 1 (Control Grid) Voltage:** -22.5 V
- **Plate Current:** 55 mA
- **Grid No. 2 Current:** 2.0 mA
- **Transconductance:** 5,500 umhos
- **Plate Resistance (Approximate):** 15,000 ohms
- **Grid No. 1 Voltage for $I_b = 0.1 \text{ mA}$ (Cutoff):** -55 V

Zero-Bias Performance (Instantaneous Values)

To demonstrate the tube's high peak current capability, the instantaneous characteristics at zero bias ($E_{c1} = 0$) with a low plate voltage are specified as follows:

- **Plate Voltage (E_b):** 60 VDC
- **Grid No. 2 Voltage (E_{c2}):** 150 VDC
- **Instantaneous Plate Current:** 260 mA
- **Instantaneous Grid No. 2 Current:** 20 mA

Triode-Connected Characteristics

When triode-connected (with the plate and Grid No. 2 tied together), the tube exhibits the following characteristic:

- **Triode Amplification Factor (μ):** 4.3 (measured with $E_b = E_{c2} = 150 \text{ V}$ and $E_{c1} = -22.5 \text{ V}$)

Design-Center Ratings and Circuit Constraints

The maximum ratings for the 12DW5 are established under the Design-Center System for vertical deflection amplifier service (pentode connected). These ratings represent limiting values that must not be

exceeded under the worst probable operating conditions, taking into account supply-voltage variations, component tolerances, and environmental factors.

Rating Parameter	Design-Center Limit
Maximum DC Plate Voltage	330 V
Maximum DC Grid No. 2 Voltage	220 V
Maximum Peak Positive Pulse Plate Voltage (Absolute Maximum)	2,200 V
Maximum Peak Negative Pulse Grid No. 1 Voltage	-250 V
Maximum Plate Dissipation	11 W
Maximum Grid No. 2 Dissipation	2.5 W
Maximum Average Cathode Current	65 mA
Maximum Peak Cathode Current	225 mA
Maximum Grid No. 1 Circuit Resistance (Self Bias)	2.2 Megohms

Heater-Cathode Voltage Limits

To prevent insulation breakdown between the heater and the cathode, the following voltage limits must be observed:

- **Heater Negative with Respect to Cathode:**
 - Maximum Total DC and Peak Voltage: 200 V
- **Heater Positive with Respect to Cathode:**
 - Maximum DC Voltage: 100 V
 - Maximum Total DC and Peak Voltage: 200 V

Circuit Design and Operational Constraints

1. **Television Scanning System Standards:** The ratings for vertical deflection service are specified for operation in a standard 525-line, 30-frame television system. Under these conditions, the duty cycle of the peak positive voltage pulse must not exceed 15% of one scanning cycle.
2. **Grid Leak Bias Protection:** In stages designed to operate with grid leak bias, the tube is vulnerable to excessive dissipation if the excitation signal is lost. To protect the tube in the absence of excitation, an adequate cathode bias resistor or other suitable protective means must be incorporated into the circuit design.

Technical Summary

The **12DW5** is a 9-pin miniature beam power pentode designed specifically for vertical deflection amplification in 110-degree television receivers. Operating from a 12.6 V, 0.6 A heater supply, it features a controlled 11-second warm-up time to prevent voltage surges in series-wired heater strings.

The tube is optimized for low-voltage, high-current operation, capable of delivering an instantaneous plate current of 260 mA at a plate voltage of only 60 V under zero-bias conditions. With a plate dissipation rating of 11 W and a peak positive pulse plate voltage rating of 2,200 V, the 12DW5 provides the robust power handling and high transconductance (5,500 umhos) required for demanding television sweep applications. Except for its heater characteristics, it is identical to the [6DW5](#).



SOURCE OPERATING CONDITIONS

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak Positive Pulse Plate Voltage	2200 V	Absolute maximum
Peak Cathode Current	225 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	55 mA	200 V plate, 150 V screen

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-Plate Capacitance	0.5 pF	—



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	Nominal
Heater current	900 mA	Nominal
Plate voltage	330 V	Typical operating conditions

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Screen voltage	220 V	Typical operating conditions
Plate current	55 mA	Typical operating conditions



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

SOURCE PDF

1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 1 · Beam Power

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HEATER VOLTAGE	12.6 V	HEATER VOLTAGE 12,6 VOLTS
HEATER WARM-UP TIME (APPROX.)	11 s	HEATER WARM—UP TIME (APPROX.) 11,0 SECONDS
HEATER VOLTAGE L2	6 V	HEATER VOLTAGE L2.6 VOLTS
GRID #	1 V	GRID #1 VOLTAGE —`Z'2,5 VOLTS
GRID #	2 V	GRID #2 VOLTAGE LSO VOLTS
PLATE CURRENT	55 mA	PLATE CURRENT 55 MA.
GRID #	2 mA	GRID #2 CURRENT 2.0 MA.
GRID VOLTAGE FOR Ib =	0.1 V	GRID VOLTAGE FOR Ib = 0.1 MA. -55 VOLTS
GRID #	2 mA	GRID #2 CURRENT ZO MA.
TRIODE AMPLIFICATION FACTOR WITH Eb =E~	2 A	TRIODE AMPLIFICATION FACTOR WITH Eb =E~2=150 V; EC1-- 22.5 4.3
TO SUPPL	7 V	TO SUPPL 7—VOLTAGE VARIATI OX r EQUIPMENT COMPONENT VARIATION, EQUIPMENT CONTR OI ADJU ST MENT r LOAD
OF TXE VOLTAGE PULSE MUST NOT E%GEED	15 V	OF TXE VOLTAGE PULSE MUST NOT E%GEED 15S OF ONE SCANNING C7CL E.
D HEATER WARM-UP TIME IS OE FI NED AS THE TIME REQUIRED FOR THE VOLTAGE aCR0	55 V	D HEATER WARM—UP TIME IS OE FI NED AS THE TIME REQUIRED FOR THE VOLTAGE aCR055 THE HEATER TO RE ALH

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM DC GRID #	2 V	MAXIMUM DC GRID #2 VOLTAGE 220 VOLTS
MAXIMUM PEAK POSITIVE PULSE PLATE VOLTAGE (ASS. MAX.)	2 V	MAXIMUM PEAK POSITIVE PULSE PLATE VOLTAGE (ASS. MAX.) 2 200 VOLTS
MAXIMUM PLATE DISSIPATION C	1 mA	MAXIMUM PLATE DISSIPATION C 1]_ WATTS
MAXIMUM GRID #	2 mA	MAXIMUM GRID #2 DISSIPATION C 2,5 WATTS
MAXIMUM AVERAGE CATHODE CURRENT	65 mA	MAXIMUM AVERAGE CATHODE CURRENT 65 MA.
MAXIMUM PEAK CATHODE CURRENT	225 mA	MAXIMUM PEAK CATHODE CURRENT 225 MA.

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