



ELECTRONIC TUBE REFERENCE

12DW8

Voltage - Triode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

3 SECTIONS

CONSTRUCTION

DIODE-TRIODE-TRIODE

Low-voltage combination tube containing two dissimilar triodes and a diode for automobile receiver circuitry. The triodes provide complementary amplification or driver functions while the diode supplies detection or rectification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	12.6 V / 450 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	3520 Ω
TRANSCONDUCTANCE	0.0027 S
AMPLIFICATION FACTOR	9.5
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM PLATE DISSIPATION	0.5 W
Published values promoted where clearly attributable to this section.	

SECTION2 Triode	
PLATE RESISTANCE	970 Ω
TRANSCONDUCTANCE	0.0065 S
AMPLIFICATION FACTOR	6.4
MAXIMUM PLATE VOLTAGE	16 V
MAXIMUM PLATE DISSIPATION	0.5 W
<i>Published values promoted where clearly attributable to this section.</i>	

SECTION3 Diode	
<i>No fixed ratings recorded.</i>	

12DW8 — Diode-Dissimilar Duo-Triode Vacuum Tube

The **12DW8** is a multi-section miniature vacuum tube designed specifically for use in low-voltage hybrid automobile radio receivers. It combines a single diode and two dissimilar triode units within a single envelope. The tube is engineered to operate directly from a standard 12-volt automotive electrical system, serving as a combined second detector, first audio amplifier stage, and transistor driver stage.

Overview and Application

In the design of hybrid automobile radios, vacuum tubes operated alongside transistors. The 12DW8 was developed to eliminate the need for a high-voltage vibrator power supply by operating its plates and grids directly from the nominal 12-volt vehicle battery supply.

The three internal sections of the 12DW8 are specialized for distinct roles in the receiver circuit:

- **Diode Section:** Functions as the second detector for demodulating the intermediate frequency (IF) signal.
- **Triode #1:** A high-transconductance, low-amplification triode optimized as the first audio voltage amplifier stage.
- **Triode #2:** A higher-current, low-resistance triode designed to act as a driver stage, supplying sufficient power to drive a power transistor output stage.

Mechanical Specifications and Basing

The 12DW8 is constructed in a miniature glass envelope and utilizes a standard small button miniature 9-pin base.

Physical Parameter	Specification
Bulb Type	T-6 1/2
Base Type	E9-1 Small Button Miniature (9-pin)
Basing Designation	9JC
Maximum Diameter	7/8 inch
Maximum Overall Length	2 3/16 inches
Maximum Seated Height	1 15/16 inches
Mounting Position	Any

Pin Connections (9JC Basing Diagram)

The 9JC basing arrangement provides separate connections for the electrodes, with Triode #1 and the Diode sharing a common cathode connection. The pinout, viewed from the bottom of the base, is as follows:

- **Pin 1:** Plate (Triode #2)
- **Pin 2:** Grid (Triode #2)
- **Pin 3:** Cathode (Triode #2)
- **Pin 4:** Heater
- **Pin 5:** Heater
- **Pin 6:** Plate (Triode #1)
- **Pin 7:** Grid (Triode #1)
- **Pin 8:** Cathode (Triode #1 and Diode)
- **Pin 9:** Plate (Diode)

The separate cathode for Triode #2 allows it to be biased independently from Triode #1 and the diode detector, which is essential for its role as a transistor driver.

Heater and Electrical Ratings

The heater of the 12DW8 is designed to operate directly from a 12.6-volt automotive electrical system, using either alternating current (AC) or direct current (DC).

Heater Characteristics

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.45 A (450 mA)
- **Heating Method:** Indirectly heated, coated unipotential cathode

Maximum Ratings (Design Maximum System)

The ratings of the 12DW8 reflect its low-voltage design. Operating voltages are strictly limited to prevent damage and ensure reliable performance under the typical variations of automotive electrical systems.

Parameter	Diode	Triode #1	Triode #2	Units
Plate Voltage	—	16.0	16.0	Volts
Positive DC Grid Voltage	—	0	0	Volts
Plate Dissipation	0.5	0.5	0.5	Watts
Grid Circuit Resistance	—	1.5	1.5	Megohms
Max. DC Heater-Cathode Voltage (Heater Negative)	16.0	16.0	16.0	Volts
Max. DC Heater-Cathode Voltage (Heater Positive)	16.0	16.0	16.0	Volts

Typical Operating Conditions and Characteristics

Under typical operating conditions in a hybrid automobile radio, the 12DW8 operates with a plate supply voltage of 12.6 V. The grids of both triodes are operated at 0 V bias, utilizing high-value grid resistors to establish contact potential bias.

Parameter	Triode #1	Triode #2	Diode	Units
Heater Voltage	12.6	12.6	12.6	Volts
Heater Current	0.45	0.45	0.45	Amp
Plate Supply Voltage	12.6	12.6	—	Volts
Grid Voltage	0	0	—	Volts
Grid Resistor	1.5	1.0	—	Megohms
Plate Voltage Dropping Resistor	100	100	—	Ohms
Plate Current	1.9	7.5	—	mA

Parameter	Triode #1	Triode #2	Diode	Units
Transconductance	2700	6500	—	μmhos
Amplification Factor	9.5	6.4	—	
Average Diode Current (at 10 V DC)	—	—	20	mA

Triode #2 is characterized by a significantly higher transconductance (6500 μmhos) and plate current (7.5 mA) compared to Triode #1 (2700 μmhos and 1.9 mA). This high-current capability is necessary to provide the low output impedance and drive current required by the input of a power transistor stage.

Direct Interelectrode Capacitances

The interelectrode capacitances of the 12DW8 are specified both with and without an external shield. When shielded, an external shield (#315) is connected to Pin 8 (the common cathode of Triode #1 and the Diode).

Triode #1 Capacitances

- **Grid to Plate (g to p):** 1.8 pF (with shield) / 1.8 pF (without shield)
- **Input: g to ($h + k$):** 2.9 pF (with shield) / 1.6 pF (without shield)
- **Output: p to ($h + k$):** 1.4 pF (with shield) / 0.7 pF (without shield)
- **Diode Plate to Triode #1 Grid (Maximum):** 0.4 pF (with shield) / 0.4 pF (without shield)

Triode #2 Capacitances

- **Grid to Plate (g to p):** 3.5 pF (with shield) / 3.2 pF (without shield)
- **Input: g to ($h + k$):** 4.4 pF (with shield) / 4.4 pF (without shield)
- **Output: p to ($h + k$):** 2.1 pF (with shield) / 0.7 pF (without shield)

The low coupling capacitance between the diode plate and the Triode #1 grid (maximum 0.4 pF) helps minimize RF/IF signal leakage into the audio preamplifier stage, ensuring clean audio detection and amplification.

Technical Summary

The **12DW8** is a specialized, low-voltage **diode-dissimilar duo-triode** vacuum tube housed in a **T-6 1/2 miniature 9-pin glass envelope** with a **9JC basing** configuration. Designed for **12-volt hybrid automobile radios**, it operates its plates and grids directly from a **12.6 V** supply, eliminating the need for high-voltage power generation.

The tube integrates three distinct functions: a **second detector diode** (capable of delivering an average current of **20 mA at 10 V**), a **first audio triode** (Triode #1: $\mu = 9.5$, $g_m = 2700 \text{ }\mu\text{mhos}$), and a **transistor driver triode** (Triode #2: $\mu = 6.4$, $g_m = 6500 \text{ }\mu\text{mhos}$, $I_p = 7.5 \text{ mA}$). With its rugged design, flexible mounting options, and low-voltage optimization, the 12DW8 represents a key evolutionary step in the transition from all-vacuum-tube to solid-state automotive electronics.

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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	225 mA	Nominal
Plate current	1.97.5 mA	Typical operating conditions

1961 TUNG SOL

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	225 mA	Nominal
Plate current	1.97.5 mA	Typical operating conditions

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