



ELECTRONIC TUBE REFERENCE

12U7

Voltage - Triode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Low-voltage twin triode designed to operate from unusually small plate supplies, making it particularly suitable for automobile, battery-powered, and other low-voltage electronic equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	8
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	12500 Ω
TRANSCONDUCTANCE	0.0016 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	15 mA
Published promoted fields populated semantically; identical repeated sections compressed.	

SECTION2 Triode	
PLATE RESISTANCE	12500 Ω
TRANSCONDUCTANCE	0.0016 S
AMPLIFICATION FACTOR	20
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	15 mA
Second identical physical triode section; added to align rows with SectionCount.	

12U7 — Low-Voltage Medium-Mu Twin Triode

The **12U7** is a miniature, nine-pin double triode containing two independent, medium-mu triode sections with separate coated unipotential cathodes. It is specifically designed for low-voltage applications, particularly in automobile radios and automotive service, where both the heater and plate potentials are obtained directly from a nominal 12-volt automotive storage battery.

Overview

The 12U7 is engineered to operate reliably under the unique electrical conditions of automotive electrical systems. Unlike conventional vacuum tubes that require high-voltage plate supplies (often 100 V to 250 V or more) generated via vibrator power supplies or dynamotors, the 12U7 is designed to run its plates directly from the 12-volt battery supply.

Each of the two independent triode sections in the 12U7 is intended for use as a general-purpose amplifier or control tube. The independent electrode connections, including separate cathodes, allow the two sections to be operated in different circuit configurations or biased independently, provided the heater-to-cathode voltage limits are respected.

Mechanical Construction and Basing

The 12U7 is housed in a T-6 1/2 glass bulb with a 9-pin miniature button base (E9-1). The tube features a 9A basing arrangement and can be mounted in any position.

Physical Dimensions

- **Maximum overall length:** 2 3/16 inches
- **Maximum seated height:** 1 15/16 inches
- **Maximum bulb length:** 1 21/32 inches
- **Maximum diameter:** 7/8 inch

Pinout Connections

The 9A basing diagram provides the following connections, viewed from the bottom of the tube:

Pin	Connection
Pin 1	Plate, Triode Section 2
Pin 2	Grid, Triode Section 2
Pin 3	Cathode, Triode Section 2
Pin 4	Heater
Pin 5	Heater
Pin 6	Plate, Triode Section 1
Pin 7	Grid, Triode Section 1
Pin 8	Cathode, Triode Section 1
Pin 9	Heater Center Tap (H_c)

Section 1 is connected to pins 6, 7, and 8, while Section 2 is connected to pins 1, 2, and 3. The heater is connected across pins 4 and 5, with pin 9 serving as a center tap.

Heater Characteristics

The heater of the 12U7 is designed to withstand the voltage fluctuations typical of automotive electrical systems.

Heater Parameter	Value
Nominal Heater Voltage	12.6 V
Nominal Heater Current	0.15 A (150 mA)
Heater Supply	AC or DC
Operational Voltage Range	10.0 to 15.9 V

- **Heater Power Calculation:** Using the nominal values, the calculated heater power is: $\text{Power} = 12.6 \text{ V} \times 0.15 \text{ A} = 1.89 \text{ W}$

The heater is designed to operate satisfactorily over a wide range of 10.0 to 15.9 Volts to accommodate the charging and discharging cycles of a 12-volt automotive storage battery. The tube's maximum ratings incorporate an adequate safety factor to ensure survival and stable operation despite these wide variations in supply voltage.

Maximum Ratings

The maximum ratings for the 12U7 are established under the Design Center System for Class A1 amplifier service:

Rating Parameter	Maximum Limit
Plate Voltage	30 V
Cathode Current	15 mA
Heater-Cathode Voltage (Heater Positive)	30 V
Heater-Cathode Voltage (Heater Negative)	30 V
Grid Circuit Resistance (Fixed Bias)	0.25 MΩ
Grid Circuit Resistance (Cathode Bias)	1.0 MΩ

These ratings emphasize the low-voltage design of the tube. The maximum plate voltage is strictly limited to 30 Volts, which is significantly lower than standard receiving triodes.

Typical Operating Conditions and Characteristics

Under typical Class A1 amplifier operation, each triode section of the 12U7 operates with the plate voltage supplied directly from the nominal battery voltage:

Parameter (Each Section)	Typical Value
Plate Voltage	12.6 V
Grid Voltage	0 V
Plate Current	1.0 mA
Plate Resistance (Approximate)	12,500 Ω
Transconductance	1,600 μmhos
Amplification Factor (μ)	20
Grid Voltage for $I_b = 10 \mu\text{A}$ (Approximate Cutoff)	-1.5 V

The relationship between the parameters is consistent with the standard triode formula: $\mu \approx g_m \times r_p$

- **Calculation:** $1,600 \text{ } \mu\text{mhos} \times 12,500 \text{ } \Omega = 0.0016 \text{ S} \times 12,500 \text{ } \Omega = 20$. This matches the published amplification factor of 20.

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12U7 are specified both with and without an external shield. When shielded, measurements are taken using an external shield (No. 315) connected to the cathode of the section under test.

Capacitance Parameter	Section 1 (Shielded)	Section 1 (Unshielded)	Section 2 (Shielded)	Section 2 (Unshielded)
Grid to Plate (g to p)	1.5 μF	1.5 μF	1.5 μF	1.5 μF
Input: g to ($h + k$)	1.8 μF	1.6 μF	1.8 μF	1.6 μF
Output: p to ($h + k$)	2.0 μF	0.40 μF	2.0 μF	0.32 μF

The use of an external shield primarily increases the output capacitance (plate to heater and cathode) from approximately 0.32–0.40 μF to 2.0 μF , while grid-to-plate capacitance remains unchanged at 1.5 μF .

Characteristic Curves and Interpretation

The published average plate and transfer characteristics for the 12U7 illustrate its performance in low-voltage environments:

- **Average Plate Characteristics (I_b vs. E_b):** These curves plot plate current in milliamperes against plate voltage up to 60 or 80 Volts. The curves are plotted for grid bias voltages (E_c) from 0 V down to -4.0 V in 0.5-volt increments. At a typical plate voltage of 12.6 V and zero grid bias, the plate current is 1.0 mA. As the plate voltage increases toward the 30 V maximum rating, the plate current rises significantly, demonstrating that the tube can deliver useful current swings even at very low operating potentials.
- **Average Transfer Characteristics (I_b vs. E_c):** These curves plot plate current against grid voltage from 0 V down to -5.0 V for various constant plate voltages (E_b) of 10, 20, 30, 40, 50, and 60 Volts. The curves show a sharp cutoff characteristic, with plate current approaching zero (approximately 10 μA) at a grid bias of -1.5 V when the plate is operated at the typical 12.6 V level.

These curves confirm that the 12U7 is optimized for high transconductance and controlled plate current at plate voltages well below those of conventional triodes.

Technical Summary

The **12U7** is a low-voltage, miniature **9-pin medium-mu twin triode** designed specifically for direct operation from a 12-volt automotive battery system. It features a **12.6 V, 0.15 A heater** with a center tap, capable of withstanding the 10.0 to 15.9 V fluctuations of automotive electrical systems. With a maximum plate voltage rating of **30 V** and a maximum cathode current of **15 mA**, the tube is optimized for low-voltage Class A1 amplification. At a typical operating point of **12.6 V** on the plate and **0 V** on the grid, each section provides an amplification factor of **20**, a transconductance of **1,600 μmhos** , and a plate resistance of approximately **12,500 Ω** . Its physical construction utilizes a **T-6 1/2 bulb** and an **E9-1 miniature button base** with a **9A basing** configuration, allowing independent operation of its two triode sections in any mounting position.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance	12500 ohm	—
Transconductance	1600 μ S	—
Amplification Factor	20	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Plate Voltage	30 V	—
Maximum Cathode Current	15 mA	—
Plate Voltage	12.6 V	ClassA,EachSection
Plate Current	1 mA	ClassA,EachSection



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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical plate voltage	12.6 V	EachSection
Typical plate current	1 mA	EachSection
Typical grid voltage	0 V	EachSection

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	30 V	PromotedValue
Maximum cathode current	15 mA	PromotedValue

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	2.7 pF	EachSection
Input capacitance	2.8 pF	EachSection
Output capacitance	1.4 pF	EachSection

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	12500 ohm	PromotedValue
Transconductance	0.0016 A/V	PromotedValue
Amplification factor	20	PromotedValue

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes,
and their source documents.

[Catalog](#)[Tube types](#)[Full books](#)[Blog](#)[Feedback & corrections](#)

© 2026 Tube Tinker