



ELECTRONIC TUBE REFERENCE

12A5

Power - Pentode Single (NOT beam) (under 10W) electronic tube

CONSOLIDATED TECHNICAL
DATA

1 SECTION
CONSTRUCTION
PENTODE

Dual-purpose power pentode intended for power-amplifier service and capable of series or parallel heater operation. Its flexible heater arrangement supports output-stage use across different receiver supply configurations.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7F	BASE PINS	7
NOMINAL HEATER	12.6 V / 300 mA	PARALLEL HEATER	6.3 V / 600 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	50000 Ω
TRANSCONDUCTANCE	0.0017 S
AMPLIFICATION FACTOR	85
MAXIMUM PLATE VOLTAGE	180 V
MAXIMUM SCREEN VOLTAGE	180 V
MAXIMUM PLATE DISSIPATION	8.25 W
MAXIMUM SCREEN DISSIPATION	2.5 W
<i>Promoted characteristics use the first listed Class A1 operating point; alternate operating point preserved in parameters.</i>	

12A5 — Pentode Power Amplifier

The **12A5** is a glass-bulb power pentode designed for audio-frequency power amplification. A defining feature of the 12A5 is its center-tapped heater, which allows the tube to be operated from either a 12.6-volt or a 6.3-volt power source. This flexibility makes it highly adaptable to different receiver designs, including AC-operated, AC/DC series-string, and 6-volt automotive systems.

Heater and Base Configuration

The 12A5 features an indirectly heated, coated unipotential cathode. The heater structure consists of two separate internal heater elements connected to a center tap. This configuration permits two distinct operating modes:

- **Series Connection:** The heaters are connected in series for operation at a nominal **12.6 V** with a current draw of **0.3 A** (AC or DC).
- **Parallel Connection:** The heaters are connected in parallel for operation at a nominal **6.3 V** with a current draw of **0.6 A** (AC or DC).

Heater Power Calculation

In both connection modes, the total power consumed by the heater remains identical:

- *Series Power:* $12.6\text{ V} \times 0.3\text{ A} = 3.78\text{ W}$
- *Parallel Power:* $6.3\text{ V} \times 0.6\text{ A} = 3.78\text{ W}$

The tube is housed in an ST-12 (or ST-12-D) glass envelope with a small 7-pin base (7-F designation). It can be mounted and operated in **any position**.

The physical dimensions of the envelope are:

- **Maximum overall length:** 4-1/8 inches
- **Maximum seated height:** 3-1/2 inches
- **Maximum bulb diameter:** 1-9/16 inches

The bottom view of the socket provides the following pin connections:

- **Pin 1:** Heater
- **Pin 2:** Plate
- **Pin 3:** Screen Grid (Grid No. 2)
- **Pin 4:** Control Grid (Grid No. 1)
- **Pin 5:** Cathode
- **Pin 6:** Heater Center Tap / Common
- **Pin 7:** Heater

Maximum Ratings

The absolute maximum operating limits established for the 12A5 under standard rating systems are:

- **Maximum Plate Voltage:** 180 V
- **Maximum Screen Voltage:** 180 V
- **Maximum Plate Dissipation:** 8.25 W
- **Maximum Screen Dissipation:** 2.5 W

Typical Operating Conditions and Characteristics

The 12A5 is typically operated as a Class A (or Class A1) audio power amplifier. The published operating points demonstrate its performance at plate and screen potentials of 100 V and 180 V:

Parameter	100 V Operating Point	180 V Operating Point
Plate Voltage	100 V	180 V
Screen Voltage	100 V	180 V
Control Grid Bias	-15 V	-25 V
Peak AF Signal Voltage	15 V	25 V
Zero-Signal Plate Current	17 mA	45 mA
Maximum-Signal Plate Current	19 mA	48 mA
Zero-Signal Screen Current	3 mA	8 mA
Maximum-Signal Screen Current	6.0 to 6.5 mA	14 mA
Plate Resistance (Approx.)	41,000 to 50,000 _Ω	35,000 to 36,000 _Ω
Transconductance	1,700 μmhos	2,400 μmhos
Amplification Factor	70	85
Load Resistance	4,500 _Ω	3,300 _Ω
Total Harmonic Distortion	12%	11%
Second Harmonic Distortion	2.5% to 8.5%	6.5%
Third Harmonic Distortion	8% to 9%	8%
Power Output	0.7 to 0.8 W	3.4 W

Note on Parameter Variations

Minor variations exist in the historical specifications for the 100 V operating point. The plate resistance is variously specified as 41,000_Ω or 50,000_Ω, while the rated power output at this lower voltage ranges from 0.7 W to 0.8 W. Additionally, the maximum-signal screen current at 100 V is rated at either 6.0 mA or 6.5

mA depending on the manufacturer's specification. Under the 180 V operating point, the plate resistance is listed between 35,000, and 36,000, .

Application and Circuit Design Guidelines

The 12A5 is a versatile power pentode. When operated with a standard 115-volt power source, its heater voltage and power output characteristics represent an intermediate design choice between the older Type [38](#) and Type [43](#) pentodes.

Receiver Power Configurations

- **AC/DC Universal Receivers:** The heaters are wired in series with other tubes in the receiver string, drawing 12.6 V at 0.3 A.
- **AC-Only or Automotive Receivers:** The heaters are wired in parallel, drawing 6.3 V at 0.6 A from a transformer or a 6-volt storage battery.

Alternative Operating Points

- **200-Volt Operation:** When connected to a 200-volt plate supply, the 12A5 can deliver an increased power output of **2.7 W** with a total cathode current of **44 mA**.
- **Automotive Economy Operation:** In car radio designs where minimizing current drain is a primary concern, the control grid bias and load impedance are slightly increased. This configuration reduces the cathode current to **36 mA** while still providing a robust **2.2 W** of audio power output.

Grid Circuit Resistance Limits

To prevent thermal runaway and maintain stable operation, the maximum allowable DC resistance in the control grid circuit must be carefully controlled:

- For **fixed-bias** circuits, the grid-circuit resistance must not exceed **500,000**, (0.5 M).
- For **self-biased** (automatic bias) circuits, the grid-circuit resistance may be increased up to a maximum of **1.0 M**.

Technical Summary

The **12A5** is a glass-envelope power pentode featuring a center-tapped heater that supports both 12.6 V / 0.3 A series and 6.3 V / 0.6 A parallel operation. Housed in an ST-12 bulb with a small 7-pin base, it is rated for a maximum plate and screen voltage of 180 V, with a maximum plate dissipation of 8.25 W. Capable of delivering up to 3.4 W of audio power in Class A service, the 12A5 served as a reliable output stage in AC, AC/DC, and automotive radio receivers.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1937 Raytheon Radio Receiving Tubes

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

1937 RAYTHEON RADIO RECEIVING TUBES

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	100 V	ClassA
Screen voltage	100 V	ClassA; PlateVoltage=100V
Grid bias	-15 V	ClassA; PlateVoltage=100V
Plate current	17 mA	ClassA; PlateVoltage=100V
Screen current	3 mA	ClassA; PlateVoltage=100V
Load resistance	4500 ohm	ClassA; PlateVoltage=100V
Power output	0.7 W	ClassA; PlateVoltage=100V
Plate voltage	180 V	ClassA
Screen voltage	180 V	ClassA; PlateVoltage=180V
Grid bias	-25 V	ClassA; PlateVoltage=180V
Plate current	45 mA	ClassA; PlateVoltage=180V
Screen current	8 mA	ClassA; PlateVoltage=180V
Load resistance	3300 ohm	ClassA; PlateVoltage=180V
Power output	3.4 W	ClassA; PlateVoltage=180V

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X General Electric Essential Characteristics

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

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	180 V	ClassA
Screen voltage	180 V	ClassA
Grid voltage	-25 V	ClassA
Plate current	45 mA	ClassA
Load resistance	3300 ohm	ClassA
Power output	3.4 W	ClassA
Plate voltage	100 V	ClassA
Screen voltage	100 V	ClassA
Load resistance	4500 ohm	ClassA
Power output	0.8 W	ClassA



SOURCE DATA APPENDIX

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 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance	35000 ohm	AlternateOperatingPoint
Transconductance	2400 uS	AlternateOperatingPoint

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Power Output	3.4 W	AlternateOperatingPoint
Maximum Plate Voltage	180 V	—
Maximum Screen Voltage	180 V	—
Maximum Plate Dissipation	8.25 W	—
Maximum Screen Dissipation	2.5 W	—

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