



ELECTRONIC TUBE REFERENCE

12AD5

Voltage - Pentode Remote Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Remote-cutoff RF pentode for gain-controlled small-signal RF or IF amplifier service in series-heater receiving equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	12.6 V / 100 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.0023 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM SCREEN DISSIPATION	0.3 W
MAXIMUM CATHODE CURRENT	10 mA
Rogers/Majestic 12AD5 remote-cutoff RF pentode with 12.6 V, 100 mA heater for receiving equipment. Design-center limits: operating plate voltage 250 V, plate dissipation 2 W, screen dissipation 0.3 W and total cathode current 10 mA. Maximum screen-grid voltage 250 V is conditional on plate current below 4 mA; at 7.2 mA plate current the permitted screen voltage is 150 V. 550 V no-current limits for plate/screen are not normal operating voltages. At manufacturer 200 V plate/supply with sliding screen and 40 kΩ screen resistor; typical gm 2300 μmhos and plate resistance $\sim$1 MΩ. Bias and screen-circuit conditions influence these characteristic values.	

12AD5 — Remote Cut-Off R.F. Pentode

The **12AD5** is an indirectly heated, remote cut-off pentode designed primarily for use as a radio frequency (R.F.) or intermediate frequency (I.F.) amplifier. Featuring a miniature construction, the tube is engineered to provide variable-mu (remote cut-off) characteristics, allowing for effective automatic volume control (AVC) or automatic gain control (AGC) in receiver circuits without introducing excessive distortion.

Mechanical Design and Pinout

The 12AD5 is constructed in a T6-1/2 glass bulb envelope and utilizes an E9-1 miniature 9-pin base. The tube is designed to operate in any mounting position. Its physical dimensions include a maximum overall diameter of 7/8 inches, a maximum overall length of 2 5/8 inches, and a seated height ranging from 2 inches to a maximum of 2 3/8 inches (2" ± 3/32").

The tube utilizes the RETMA basing designation **9AZ**. The pin connections, viewed from the bottom of the base, are assigned as follows:

Pin Number	Electrode Element
1	Grid No. 2 (Screen Grid)
2	Grid No. 1 (Control Grid)
3	Cathode, Grid No. 3 (Suppressor Grid), and Internal Shield
4	Heater
5	Heater
6	Plate (Anode)
7	Internal Connection (Do not use)
8	Internal Connection (Do not use)
9	No Connection

Pins 7 and 8 are designated for internal connections and must not be used for external circuit wiring, while Pin 9 has no internal connection. The integration of Grid No. 3 (suppressor grid) and the internal shield with the cathode on Pin 3 simplifies external circuitry and aids in minimizing parasitic feedback at high frequencies.

Heater and Interelectrode Capacitances

The 12AD5 features a coated unipotential cathode heated by a nominal 12.6-volt supply.

Heater Specifications

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.1 A
- **Calculated Heater Power:** 1.26 W (calculated as $12.6\text{ V} \times 0.1\text{ A}$)

Direct Interelectrode Capacitances

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

- **Input Capacitance (Grid No. 1 to all other electrodes except Plate):** 5.1 μF
- **Output Capacitance (Plate to all other electrodes except Grid No. 1):** 8.1 μF
- **Grid No. 1 to Plate Capacitance:** 0.002 μF (maximum)
- **Grid No. 1 to Heater Capacitance:** 0.05 μF (maximum)

The extremely low grid-to-plate capacitance (0.002 μF maximum) is a critical parameter for stable R.F. and I.F. amplification, preventing unwanted Miller-effect feedback and oscillation at high operating frequencies.

Maximum Ratings (Design Center Values)

The maximum ratings for the 12AD5 are established under the Design Center system. Operating the tube beyond these limits may impair its performance and longevity.

Parameter	Maximum Rating
Plate Voltage (without current)	550 V
Plate Voltage	250 V
Plate Dissipation	2.0 W
Grid No. 2 Voltage (without current)	550 V
Grid No. 2 Voltage (plate current < 4 mA)	250 V
Grid No. 2 Voltage (plate current = 7.2 mA)	150 V
Grid No. 2 Dissipation	0.3 W
Cathode Current	10 mA
Voltage between Heater and Cathode	150 V
External Resistance between Grid No. 1 and Cathode	3 M Ω
External Resistance between Heater and Cathode	20,000 Ω

The maximum allowable Grid No. 2 (screen grid) voltage is dynamically linked to the plate current. When the plate current is low (less than 4 mA), the screen grid can withstand up to 250 V. However, under typical full-conduction operating conditions where plate current reaches 7.2 mA, the maximum screen grid voltage rating is reduced to 150 V to prevent exceeding the 0.3-watt screen dissipation limit.

Operating Characteristics and Circuit Configurations

The 12AD5 can be operated as an R.F. or I.F. amplifier using either a sliding (series-resistor fed) screen grid voltage or a fixed screen grid voltage.

A. Operation with Sliding Grid No. 2 Voltage

In this configuration, Grid No. 2 is supplied from the plate voltage source through a 40,000-ohm series resistor. A 325-ohm cathode resistor provides self-bias. As the negative bias on Grid No. 1 increases (for example, via AVC action), the plate and screen currents decrease. This reduction in screen current decreases the voltage drop across the 40,000-ohm series resistor, causing the screen grid voltage to "slide" upward toward the supply voltage, which extends the cut-off region.

Parameter	Supply: 100 V	Supply: 170 V	Supply: 200 V
Grid No. 2 Series Resistor	40,000 Ω	40,000 Ω	40,000 Ω
Cathode Resistor	325 Ω	325 Ω	325 Ω
Grid No. 1 Voltage	-1.4 V to -17 V	-2.5 V to -28 V	-3.0 V to -34 V
Plate Current	3.3 mA (at min bias)	6.0 mA (at min bias)	7.2 mA (at min bias)
Grid No. 2 Current	1.0 mA (at min bias)	1.75 mA (at min bias)	2.1 mA (at min bias)
Transconductance	1900 to 19 μmhos	2200 to 22 μmhos	2300 to 23 μmhos
Plate Resistance	0.8 to >10 M Ω	1.0 to >10 M Ω	1.0 to >10 M Ω
Grid No. 2 to Grid No. 1 Mu (μ_{g2-g1})	18	18	18
Equivalent Noise Resistance	5500 Ω (at min bias)	6500 Ω (at min bias)	7000 Ω (at min bias)

B. Operation with Fixed Grid No. 2 Voltage

Alternatively, the tube can be operated with a fixed screen grid voltage of 100 V, using a 325-ohm cathode resistor for self-bias.

- **Plate Voltage:** 100 V
- **Grid No. 2 Voltage:** 100 V
- **Cathode Resistor:** 325 Ω

- **Grid No. 1 Voltage Range:** -2.5 V to -16.5 V
- **Plate Current (at -2.5 V):** 6.0 mA
- **Grid No. 2 Current (at -2.5 V):** 1.75 mA
- **Transconductance:** 2200 μmhos (at -2.5 V) decreasing to 22 μmhos (at -16.5 V)
- **Plate Resistance:** 0.6 M Ω (at -2.5 V) increasing to >10 M Ω (at -16.5 V)
- **Grid No. 2 to Grid No. 1 Amplification Factor (μ_{g2-g1}):** 18
- **Equivalent Noise Resistance (at -2.5 V):** 6500 Ω

Comparing the two methods, the sliding screen voltage configuration allows the tube to handle much larger negative grid bias swings (up to -34 V with a 200 V supply) before reaching the 22 or 23 μmhos transconductance level, compared to the fixed screen configuration which cuts off to 22 μmhos at -16.5 V.

Analysis of Characteristic Curves

The relationship between the control grid (Grid No. 1) voltage and the resulting plate current or transconductance highlights the remote cut-off design of the 12AD5.

At low negative bias values, the transconductance is high (typically 1900 to 2300 μmhos), providing high stage gain for weak signals. As the negative bias increases, the transconductance drops smoothly and logarithmically. Under sliding screen conditions, the screen voltage rises as plate current drops, which softens the cut-off characteristic and prevents cross-modulation or clipping of strong incoming signals.

The screen grid current characteristics show that when using a 40,000-ohm series resistor, the operating path of the screen grid remains safely below the 0.3-watt Grid No. 2 dissipation curve across the entire range of plate and screen voltages (from 100 V to 200 V supply levels).

Technical Summary

The **12AD5** is a high-performance, remote cut-off R.F. pentode featuring a 9-pin miniature construction (E9-1 base) and a 12.6 V, 0.1 A heater. It is optimized for variable-gain R.F. and I.F. amplifier stages in communication receivers. With a low feedback capacitance of 0.002 μF , a maximum plate dissipation of 2.0 W, and a screen grid amplification factor of 18, the 12AD5 offers robust and stable gain control characteristics. Its ability to operate with either a fixed screen voltage or a sliding screen voltage via a 40,000-ohm series resistor provides circuit designers with flexibility in tailoring the AGC/AVC control range and signal-handling capabilities.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1959 Rogers

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

1959 ROGERS

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentVoltage	12.6 V	—
HeaterOrFilamentCurrent	100 mA	—
CutoffCharacteristic	Remote cutoff	—

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