



ELECTRONIC TUBE REFERENCE

12AC5

Voltage Pentode - Remote Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Remote-cutoff RF pentode for gain-controlled RF and IF amplification, providing smooth automatic-gain-control action in receiving equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	NOVAL	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	550 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2 W
MAXIMUM SCREEN DISSIPATION	0.3 W
MAXIMUM CATHODE CURRENT	10 mA

12AC5 — Remote Cut-Off R.F. Pentode

The **12AC5** is a remote cut-off radio frequency (R.F.) pentode designed with a coated unipotential cathode. It was introduced in October 1955 by N.V. Philips' Gloeilampenfabrieken.

Physical Specifications and Basing Connections

The 12AC5 is constructed in a compact glass envelope utilizing an **E8-30** base. It is designed to operate in any mounting position. The physical dimensions of the tube are as follows:

Dimension	Value
Maximum overall length	2-3/8 inches (60 mm)
Maximum seated height	2-1/16 inches (53 mm)
Maximum diameter	7/8 inches (22 mm)

The tube utilizes the **8GW** basing connection arrangement. The pin assignments, viewed from the bottom of the tube, are:

- **Pin 1:** Heater
- **Pin 2:** Plate
- **Pin 3:** Internal connection
- **Pin 4:** Internal connection
- **Pin 5:** Grid No. 2 (Screen Grid)
- **Pin 6:** Grid No. 1 (Control Grid)
- **Pin 7:** Cathode, Grid No. 3 (Suppressor Grid), and internal shield
- **Pin 8:** Heater

Pins 3 and 4 are reserved for internal connections and must not be used for external circuit tie points. Pin 7 internally ties the cathode, the suppressor grid (Grid No. 3), and the internal shield together to minimize interelectrode coupling and simplify external wiring.

Heater and Maximum Ratings

The heater of the 12AC5 is designed for series or parallel operation with the following electrical specifications:

- **Heater Voltage:** 12.6 volts
- **Heater Current:** 0.1 amperes

The maximum operating limits are established under the Design Centre Rating System. Operating the tube beyond these limits may impair its performance and longevity:

Parameter	Maximum Rating
Plate supply voltage	550 volts
Plate voltage	250 volts
Plate dissipation	2 watts

Parameter	Maximum Rating
Grid No. 2 supply voltage	550 volts
Grid No. 2 voltage (at plate current < 4 mA)	250 volts
Grid No. 2 voltage (at plate current = 7.2 mA)	150 volts
Grid No. 2 dissipation	0.3 watts
Cathode current	10 mA
Grid No. 1 circuit resistance	3 megohms
Voltage between heater and cathode	150 volts
External resistance between heater and cathode	20,000 ohms

Operating Characteristics and Capacitances

Under typical Class A amplifier operating conditions, the 12AC5 exhibits the following electrical characteristics:

- **Plate Voltage:** 200 volts
- **Grid No. 2 Voltage:** 116 volts
- **Grid No. 1 Voltage:** -3.0 volts
- **Plate Current:** 7.2 mA
- **Grid No. 2 Current:** 2.1 mA
- **Transconductance:** 2,300 μ mhos
- **Plate Resistance:** 1 megohm
- **Amplification Factor (Grid No. 2 with respect to Grid No. 1):** 18

The remote cut-off characteristic of the control grid is demonstrated by the bias required to reduce transconductance to a very low level. Specifically, a Grid No. 1 bias of **-34 volts** reduces the transconductance to **23 μ mhos**.

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

- **Plate to Grid No. 1:** 0.002 μ F
- **Grid No. 1 to Heater:** 0.05 μ F
- **Input Capacitance:** 5.0 μ F
- **Output Capacitance:** 7.0 μ F

The extremely low plate-to-grid capacitance (0.002 μ F) is achieved through the internal shielding connected to Pin 7, which is critical for stable high-gain R.F. amplification without self-oscillation.

Analysis of Characteristic Curves

The relationship between control grid bias, screen grid voltage, plate current, and transconductance is illustrated by the tube's characteristic curves across a plate voltage range of 100 to 200 volts.

Transconductance vs. Grid No. 1 Bias

The transconductance curves show a smooth, logarithmic decline as the negative Grid No. 1 bias increases. At a Grid No. 2 voltage of 200 V, the transconductance remains relatively high over a wider bias range, whereas lower Grid No. 2 voltages (such as 50 V or 75 V) result in a much sharper cut-off.

When operating with a screen-dropping resistor, the transconductance characteristic is modified. For a supply voltage of 170 V with a 40,000-ohm Grid No. 2 series resistor, or a supply voltage of 100 V with a 40,000-ohm series resistor, the transconductance curve transitions dynamically across the constant-voltage curves. This series-resistor configuration provides a more linear control characteristic over a wide range of input signal levels.

Plate Current vs. Grid No. 1 Bias

The plate current curves mirror the transconductance behavior, showing a gradual reduction in plate current as the Grid No. 1 bias becomes more negative. Under constant Grid No. 2 voltage conditions, higher screen voltages significantly increase the plate current at low bias levels. The addition of a 40,000-ohm series resistor to Grid No. 2 (from either a 170 V or 100 V supply) automatically reduces the screen voltage as plate current rises, preventing excessive plate and screen dissipation at low bias levels while maintaining a smooth remote cut-off characteristic.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1999 Philips 0-D

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

1999 PHILIPS 0-D

Section 1 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	200 V	—
Screen voltage	116 V	—
Plate current	7.2 mA	—
Screen current	0.7 mA	—
Grid voltage	-3 V	—
Transconductance	2300 μ S	—
Plate resistance	1000000 ohm	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate supply voltage	550 V	—
Maximum grid circuit resistance	3 Mohm	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-heater capacitance maximum	0.05 pF	—