



ELECTRONIC TUBE REFERENCE

1609

Voltage - Pentode Sharp Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Coated-filament sharp-cutoff pentode designed for Class A amplifier service. RCA later recommended type 1620 for new equipment, but the 1609 remains a fixed-gain signal amplifier with filamentary cathode construction.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	5
NOMINAL HEATER	1.1 V / 250 mA	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	400000 Ω
TRANSCONDUCTANCE	0.000725 S
AMPLIFICATION FACTOR	300
MAXIMUM PLATE VOLTAGE	135 V
MAXIMUM SCREEN VOLTAGE	67.5 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM SCREEN DISSIPATION	1 W
<i>Published promoted values applied where semantically applicable; additional table values retained in section parameters.</i>	

1609 — Low-Microphonic Sharp-Cutoff Pentode

The **1609** is a sharp-cutoff pentode of the coated-filament type designed specifically for audio-frequency voltage amplification. It is engineered for use in battery-operated installations where susceptibility to microphonics is a critical design constraint.

Overview

The 1609 is optimized for low-noise, low-microphonic performance in sensitive preamplifier and audio-frequency stages. It features a filament designed for low-voltage DC operation, making it highly suitable for portable or battery-powered equipment. In later equipment designs, the manufacturer recommended the metal-envelope **1620** sharp-cutoff pentode (similar to the [6J7](#)) as a replacement, which utilizes an octal base and a 6.3 V heater.

Construction, Filament, and Physical Specifications

The 1609 is constructed with a coated filament housed in an ST-12 glass bulb. The physical dimensions and mounting requirements are as follows:

- **Maximum Overall Length:** 4-3/16 inches
- **Maximum Seated Height:** 3-9/16 inches
- **Maximum Diameter:** 1-9/16 inches
- **Base:** Small 5-pin

Filament Ratings and Power Supply

The filament is designed to operate from dry-cells or a single lead storage cell.

Filament Parameter	Value
Filament Voltage (D-C)	1.1 V
Filament Current	0.25 A
Calculated Filament Power	0.275 W

The calculated filament power consumption of 0.275 W is derived from the nominal operating voltage of 1.1 V and current of 0.25 A (1.1 V multiplied by 0.25 A).

For multi-tube installations, the filaments of multiple 1609 tubes should preferably be connected in parallel. Series connection is permissible provided that the supply is regulated to maintain the rated filament current of 0.25 amperes across all series-connected filaments.

Pinout and Socket Connections

The tube fits a standard 5-contact socket. The pin connections, viewed from the bottom of the tube, are:

- **Pin 1:** Filament (+)
- **Pin 2:** Plate
- **Pin 3:** Grid No. 1 (Control Grid)
- **Pin 4:** Grid No. 2 (Screen Grid)
- **Pin 5:** Filament (-) and Grid No. 3 (Suppressor Grid)

The suppressor grid (Grid No. 3) is internally tied to the negative side of the filament at Pin 5.

Mounting Position

Early specifications dictate that the tube must be mounted in a vertical position. If horizontal operation is unavoidable, the tube must be oriented so that the plate lies in a vertical plane (on edge) to prevent filament sag. Later specifications permit mounting in any position.

Electrical Characteristics and Operating Points

The 1609 operates as a Class A1 audio-frequency amplifier. Typical operating parameters and characteristics under standard conditions are:

Parameter	Typical Value
Plate Voltage	135 V
Screen Voltage (Grid No. 2)	67.5 V
Control-Grid Voltage (Grid No. 1)	-1.5 V
Plate Current	2.5 mA
Screen Current	0.65 mA
Plate Resistance (Approximate)	0.4 M Ω (400,000 Ω)
Amplification Factor (Approximate)	300
Transconductance	725 μ mhos

Grid Circuit Resistance Limits

When the input circuit of the 1609 is resistance-coupled, the DC resistance in the control-grid circuit must not exceed **0.5 megohm** under fixed-bias conditions to ensure bias stability.

Maximum Ratings

The maximum ratings for the 1609 are absolute values and must not be exceeded under any operating conditions:

- **Maximum D-C Plate Voltage:** 135 V

- **Maximum D-C Screen Voltage (Grid No. 2):** 67.5 V

Interelectrode Capacitances

The direct interelectrode capacitances of the 1609, measured without an external shield, are:

- **Grid to Plate (Maximum):** 1.0 μf (with some early tentative specifications listing up to 1.1 μf)
- **Input Capacitance:** 7 μf (with some early tentative specifications listing 6.7 μf)
- **Output Capacitance:** 7 μf

Average Characteristics and Curve Interpretation

The electrical behavior of the 1609 is illustrated by its average plate and transfer characteristics:

Plate Characteristics

At a constant screen voltage of 67.5 V and a filament voltage of 1.1 V DC, the plate current curves demonstrate classic pentode behavior. For a control-grid bias of -1.5 V, the plate current remains nearly constant at approximately 2.5 mA for plate voltages above 50 V, reflecting the high plate resistance (approximately 0.4 megohm). As the control-grid voltage is varied from 0 V down to -6.0 V, the plate current curves shift downward, showing a corresponding reduction in plate current.

Transfer Characteristics

With the plate voltage held at 135 V and the screen voltage at 67.5 V, the transconductance (g_m), plate current (I_b), and screen current (I_{c2}) vary with the control-grid voltage:

- At $E_{c1}(\text{tubes}/C1) = -1.5 \text{ V}$, the transconductance is 725 μmhos , plate current is 2.5 mA, and screen current is 0.65 mA.
- As the control-grid bias becomes more negative, all three parameters decrease.
- The tube reaches cutoff at approximately -7 V, where the transconductance and plate current approach zero.

Related Designations and Recommendations

The 1609 belongs to a specialized class of low-microphonic amplifier tubes. For new equipment designs, the manufacturer recommended the **1620**, which is a metal-type sharp-cutoff pentode similar to the [6J7](#). The 1620 features an octal 7-pin base, a miniature top cap, and a 6.3 V, 0.3 A heater, offering a more modern construction for applications requiring low microphonics.

Technical Summary

The **1609** is a specialized, low-microphonic, sharp-cutoff pentode featuring a 1.1 V, 0.25 A coated filament and a small 5-pin base. It is designed for Class A1 audio-frequency voltage amplification in battery-operated systems. Operating with a maximum plate voltage of 135 V and a maximum screen voltage of

67.5 V, it provides an amplification factor of approximately 300, a plate resistance of 0.4 megohms, and a transconductance of 725 μmhos . Its low-microphonic design and low filament power consumption make it highly suited for sensitive portable audio applications, though it was eventually superseded by the metal-cased 1620 for new equipment designs.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1938 RCA Transmitting Tubes

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

1938 RCA TRANSMITTING TUBES

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterVoltageNominal	1.1 V	Nominal
HeaterCurrentNominal	250 mA	Nominal
Maximum Plate Voltage	135 V	—
Maximum Screen Voltage	67.5 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	725 μ S	Typical
Amplification Factor	300	Typical
Plate Resistance	400000 ohm	Typical



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1960 RCA Industrial and Communications Types

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

1960 RCA INDUSTRIAL AND COMMUNICATIONS TYPES

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentVoltage	1.1 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentCurrent	250 mA	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	135 V	ClassA
Plate Current	2.5 mA	ClassA



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 3 of 7

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

1971 RCA HB3 BINDER 3 OF 7
Section 1 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage	1.1 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Current	0.25	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid to Plate	1	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 1 -Filament + – published value 1	1	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 1 -Filament + – published value 2	4	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Plate – published value 1	2	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Plate – published value 2	5	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Pin 3 -Grid	3	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Voltage	67.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate	135 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen	67.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid '	-1.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Res	0.4 Mohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Cur	2.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Cur	0.65 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
' The d-c resistance in the grid circuit	1609	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Ef=1.1 VOLTS D.C	1.1 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
SCREEN VOLTS=67.5 – published value 1	67.5 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
SCREEN VOLTS=67.5 – published value 2	4 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Voltage	135 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.



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