

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

1620

1 SECTION
CONSTRUCTION
PENTODE

Voltage - Pentode Sharp Cutoff (single) electronic tube

Metal sharp-cutoff pentode electrically similar to the 6J7 but selected for low-microphonic applications. Manufacturer data include normal pentode and triode-connected operation for sensitive Class A signal amplification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7R	BASE PINS	7
NOMINAL HEATER	6.3 V / 300 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7R - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – SH	A	SH – Internal Shield	CONNECTED
PIN2 – H	–	H – Heater	CONNECTED
PIN3 – P	A	P – Plate (Anode)	CONNECTED
PIN4 – G2	A	G2 – Screen Grid	CONNECTED
PIN5 – G3	A	G3 – Suppressor Grid	CONNECTED
PIN7 – H	–	H – Heater	CONNECTED
PIN8 – K	A	K – Cathode	CONNECTED
CAP1 – G1	A	G1 – Control Grid	CONNECTED

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.001225 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	100 V
MAXIMUM PLATE DISSIPATION	1.75 W
<i>Published promoted values applied where semantically applicable; additional table values retained in section parameters.</i>	

1620 — Sharp-Cutoff Pentode Detector Amplifier

The **1620** is a premium metal-shell, sharp-cutoff pentode designed specifically for low-noise audio amplification and detector applications where microphonics must be kept to an absolute minimum. It is classified as a low-microphonic amplifier tube and is highly optimized for applications critical as to microphonics.

Overview

The 1620 is a specialized receiving tube featuring a metal envelope, a miniature top cap, and a small wafer octal 7-pin base. It is electrically and physically similar to the standard **6J7** sharp-cutoff pentode but is manufactured and selected under stringent controls to ensure low-microphonic performance. In historical equipment design, the 1620 was recommended as a modern, low-microphonic replacement for older types such as the **1609** (a coated-filament type with a small 5-pin base).

The tube can be operated either in its primary pentode configuration or as a triode by connecting the screen grid (Grid No. 2) and suppressor grid (Grid No. 3) directly to the plate. It is designed to operate in any mounting position.

Physical Construction and Base Pinout

The 1620 is housed in an MT-8 metal shell with a miniature top cap for the control grid (Grid No. 1). It utilizes a small wafer octal 7-pin base (basing designation 7R). The pin connections, viewed from the bottom of the tube, are as follows:

Pin Number	Electrode Connection
Pin 1	Metal Shell (connected to cathode)
Pin 2	Heater
Pin 3	Plate

Pin Number	Electrode Connection
Pin 4	Screen Grid (Grid No. 2)
Pin 5	Suppressor Grid (Grid No. 3)
Pin 7	Heater
Pin 8	Cathode
Top Cap	Control Grid (Grid No. 1)

Physical Dimensions

- **Maximum Overall Length:** 3-1/8 inches
- **Maximum Seated Height:** 2-9/16 inches
- **Maximum Diameter:** 1-5/16 inches

Heater Characteristics

The 1620 features an indirectly heated, coated unipotential cathode. The heater can be energized by either alternating current (AC) or direct current (DC).

- **Nominal Heater Voltage:** 6.3 V
- **Nominal Heater Current:** 0.3 A
- **Calculated Heater Power:** 1.89 W (calculated as 6.3 V * 0.3 A)

Electrical Characteristics and Operating Points

The 1620 can be operated as either a sharp-cutoff pentode or a triode. The typical operating conditions for both modes in Class A1 amplifier service are detailed below.

Pentode Connection

In the pentode configuration, the suppressor grid (Grid No. 3) is connected directly to the cathode at the socket.

Parameter	Operating Point I	Operating Point II
Plate Voltage	100 V	250 V
Screen Voltage (Grid No. 2)	100 V	100 V
Control Grid Voltage (Grid No. 1)	-3 V	-3 V
Suppressor Grid (Grid No. 3)	Connected to cathode	Connected to cathode
Plate Resistance	1.0 MΩ	Greater than 1.0 MΩ

Parameter	Operating Point I	Operating Point II
Transconductance	1185 μmhos	1225 μmhos
Grid Bias for Cathode Current Cut-off	-7 V	-7 V
Plate Current	2.0 mA	2.0 mA
Screen Current	0.5 mA	0.5 mA

Triode Connection

For triode operation, the screen grid (Grid No. 2) and suppressor grid (Grid No. 3) are tied directly to the plate.

Parameter	Operating Point I	Operating Point II
Plate Voltage	180 V	250 V
Control Grid Voltage (Grid No. 1)	-5.3 V	-8 V
Amplification Factor	20	20
Plate Resistance	11,000 Ω	10,500 Ω
Transconductance	1800 μmhos	1900 μmhos
Plate Current	5.3 mA	6.5 mA

Note on Triode Calculations: The relationship between amplification factor, transconductance, and plate resistance can be verified mathematically. For Operating Point II, the calculated amplification factor is $1900 \mu\text{mhos} \times 10,500 \Omega = 19.95$ (calculated from transconductance and plate resistance), which closely aligns with the published nominal value of 20.

Maximum Ratings

The maximum ratings for the 1620 are established under the Design-Center system. These limits must not be exceeded under the worst-case operating conditions.

Pentode Connection Ratings

- **Maximum Plate Voltage:** 250 V
- **Maximum Screen Voltage (Grid No. 2):** 100 V
- **Maximum Plate Dissipation:** 0.75 W
- **Maximum Screen Input:** 0.1 W

Triode Connection Ratings

- **Maximum Plate Voltage:** 250 V
- **Maximum Plate Dissipation:** 1.75 W

Grid Circuit Resistance

- **Maximum D-C Grid Circuit Resistance:** Under maximum rated conditions, the d-c resistance in the grid circuit must not exceed 1.0 MΩ.

Hum Reduction and Cathode-Bias Operation

Because the 1620 is designed for high-gain, low-noise, and low-microphonic applications, minimizing hum is a critical design consideration. The following guidelines apply to cathode-bias operation:

- **Cathode Bypass Condenser:** A minimum cathode-resistor bypass condenser of 25 μF is recommended to minimize hum, especially in circuits where the 1620 is immediately followed by high-gain stages.
- **Heater-to-Cathode Voltage (with 25 μF or larger bypass):** When a bypass condenser of 25 μF or larger is used, the voltage difference between the heater and the cathode is not highly critical, though it should still be kept as low as possible.
- **Heater-to-Cathode Voltage (with less than 25 μF bypass):** If a bypass condenser smaller than 25 μF is used, positive or negative biasing of the heater with respect to the cathode is required. The bias voltage must be adjusted to minimize hum and must fall within the range of +5 V to +50 V or -5 V to -50 V.

Interelectrode Capacitances

The direct interelectrode capacitances of the 1620 are measured with the metal shell connected directly to the cathode.

Pentode Connection Capacitances

- **Grid to Plate (Control Grid to Plate):** 0.005 pF (maximum)
- **Input Capacitance:** 7.0 pF
- **Output Capacitance:** 12.0 pF

These low capacitances, particularly the extremely low grid-to-plate feedback capacitance of 0.005 pF, are characteristic of a high-performance sharp-cutoff pentode and help prevent unwanted oscillations in high-gain RF or audio stages.

Related Types and Designations

The 1620 is closely related to several other vacuum tubes in construction and electrical behavior:

- **6J7:** The 1620 is a low-microphonic variant of the standard **6J7** metal pentode. The characteristic curves published for the **6J7** apply directly to the 1620.

- **1612:** The physical outline dimensions of the 1620 are identical to those of the **1612** pentagrid mixer.
- **1609:** The 1620 was recommended as a superior alternative to the older **1609** low-microphonic triode/pentode for new equipment designs, offering the advantages of a modern metal envelope and an octal base.

Technical Summary

The **1620** is a premium, low-microphonic, sharp-cutoff metal pentode designed for sensitive detector and preamplifier applications. Featuring a 6.3 V, 0.3 A heater, an octal 7-pin base, and a miniature top cap, it provides highly stable Class A1 amplification. In pentode operation, it delivers a transconductance of up to 1225 μmhos with a plate resistance exceeding 1.0 M Ω . When triode-connected, it operates with an amplification factor of 20 and a plate resistance of approximately 10.5 k Ω . By incorporating specific cathode-bypass and heater-biasing techniques, designers can achieve exceptionally low hum levels, making the 1620 an ideal choice for high-gain audio circuitry where microphonics and noise must be minimized.

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

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	7 pF	Section1
Output capacitance	2 pF	Section1
Grid-to-plate capacitance	0.005 pF	Section1

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA
Screen voltage	100 V	ClassA
Control-grid voltage	-3 V	ClassA
Plate current	2 mA	ClassA
Screen current	0.5 mA	ClassA
Plate voltage	100 V	ClassA
Screen voltage	100 V	ClassA
Control-grid voltage	-3 V	ClassA
Plate current	2 mA	ClassA
Screen current	0.5 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	1000000 Ω	250VPlate
Transconductance	1225 μS	250VPlate
Plate resistance	1000000 Ω	100VPlate
Transconductance	1185 μS	100VPlate



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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA1;PentodeConnection
Screen supply	100 V	ClassA1;PentodeConnection
Grid bias	-3 V	ClassA1;PentodeConnection
Plate current	2 mA	ClassA1;PentodeConnection

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Triode-connected plate resistance	10500 Ohm	TriodeConnection;PlateVoltage=250V
Triode-connected transconductance	1900 uS	TriodeConnection;PlateVoltage=250V
Triode-connected amplification factor	20	TriodeConnection



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

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage	6.3 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Current	0.3	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Heater – published value 1	2	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 2 -Heater – published value 2	7	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 3 -Plate – published value 1	3	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 3 -Plate – published value 2	8	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Pin 4 -Screen	4	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate – published value 1	100 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate – published value 2	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen – published value 1	100 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen – published value 2	100 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid – published value 1	-3 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid – published value 2	-3 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Res	1 Mohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
current cut-off – published value 1	-7 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
current cut-off – published value 2	-7 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Cur – published value 1	2 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Cur – published value 2	2 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Cur – published value 1	0.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Cur – published value 2	0.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate – published value 1	180 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate – published value 2	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid # – published value 1	5.3 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Grid # – published value 2	0 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Res – published value 1	11000 ohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Res – published value 2	10500 ohm	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Cur – published value 1	5.3 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Cur – published value 2	6.5 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
when a 25 yf condenser or larger is used, the voltage difference De–	25 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	0.005 mA	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Plate Voltage	250 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.
Screen Voltage	100 V	Published datasheet value; multiple numbers on one source row represent separate limits or operating conditions.

TUBE TINKER

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