

ELECTRONIC TUBE REFERENCE

19HV8

Voltage Triode Pentode electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
PENTODE-TRIODE

Triode-pentode for intermediate-frequency and audio-frequency voltage amplification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9FA	BASE PINS	9
NOMINAL HEATER	18.9 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

9FA - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	B	G1 – Control Grid	CONNECTED
PIN2	B	P – Plate (Anode)	CONNECTED
PIN3	B	K – Cathode	CONNECTED
PIN4	–	H – Heater	CONNECTED
PIN5	–	H – Heater	CONNECTED
PIN6	A	P – Plate (Anode)	CONNECTED
PIN7	A	G2 – Screen Grid	CONNECTED
PIN8	A	G3 – Suppressor Grid	CONNECTED
PIN8	A	K – Cathode	CONNECTED
PIN8	–	IS – Internal Screen	CONNECTED

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	200000 Ω
TRANSCONDUCTANCE	0.0065 S
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3 W
MAXIMUM SCREEN DISSIPATION	0.55 W

SECTION2 Triode	
PLATE RESISTANCE	54000 Ω
TRANSCONDUCTANCE	0.0013 S
AMPLIFICATION FACTOR	70
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	0.55 W

19HV8 — High-Mu Triode and Sharp-Cutoff Pentode

An indirectly heated, multi-section miniature vacuum tube combining a high-mu triode and a sharp-cutoff pentode in a single envelope, designed for series-string radio receiver applications.

Overview

The **19HV8** is a multi-section miniature vacuum tube containing a high-mu triode and a sharp-cutoff pentode within a single glass envelope. It is designed primarily for use in radio receivers employing 150 mA series-connected heater strings. Within these receiver designs, the sharp-cutoff pentode section is intended for service as an intermediate-frequency (IF) amplifier, while the high-mu triode section is optimized for audio-frequency (AF) voltage amplification. The integration of these two distinct stages into a single envelope allows for compact, cost-effective receiver layouts.

Heater and Physical Construction

The 19HV8 features a coated unipotential cathode structure. The heater is designed for series-string operation with a nominal current of 0.15 A (150 mA) with a tolerance of ± 0.009 A. The nominal heater voltage at this bogey current is 18.9 V.

Heater Power Calculation

Using the nominal heater voltage ($V_h = 18.9$ V) and nominal heater current ($I_h = 0.15$ A), the calculated heater power dissipation is: $P_h = 18.9 \text{ V} \times 0.15 \text{ A} = 2.835 \text{ W}$

The tube is housed in a T-6 1/2 glass envelope with a small button 9-pin (E9-1) base. It conforms to the EIA 6-2 (or 6B) outline. The physical dimensions are:

- **Maximum Diameter:** 7/8 inch (0.875 inches)
- **Maximum Overall Length:** 2 3/16 inches (2.187 inches)
- **Maximum Seated Height:** 1 15/16 inches (1.937 inches)

The tube can be mounted and operated in any position.

Strict limits are placed on the voltage between the heater and the cathodes to prevent insulation breakdown:

- **Heater Positive with respect to Cathode:** The DC component must not exceed 100 V, and the total combined DC and peak voltage must not exceed 200 V.
- **Heater Negative with respect to Cathode:** The total combined DC and peak voltage must not exceed 200 V.

Pinout and Terminal Connections

The 19HV8 utilizes the **9FA** basing arrangement. The pin connections, viewed from the bottom of the base, are assigned as follows:

Pin	Connection
Pin 1	Grid (Triode)
Pin 2	Plate (Triode)
Pin 3	Cathode (Triode)
Pin 4	Heater
Pin 5	Heater
Pin 6	Plate (Pentode)
Pin 7	Grid Number 2 / Screen Grid (Pentode)
Pin 8	Cathode, Grid Number 3 (Suppressor Grid), and Internal Shield (Pentode)
Pin 9	Grid Number 1 / Control Grid (Pentode)

Electrical Characteristics and Typical Operation

The two sections of the 19HV8 operate under distinct typical Class A1 conditions:

Pentode Section

Under typical operating conditions, the pentode section functions with a plate voltage of 125 V and a screen grid (Grid No. 2) voltage of 125 V. With a control grid (Grid No. 1) bias of -1.0 V, the section exhibits:

- **Plate Current:** 12 mA
- **Screen Current:** 4.0 mA
- **Plate Resistance (approximate):** 200,000,
- **Transconductance:** 6,500 μ mos
- **Cutoff Bias (approximate, for a plate current of 20 μ A):** -9 V

Triode Section

The high- μ triode section typically operates with a plate voltage of 100 V and a control grid bias of -1.0 V. Under these conditions, its characteristics are:

- **Plate Current:** 0.8 mA
- **Amplification Factor (μ):** 70
- **Plate Resistance (approximate):** 54,000,
- **Transconductance:** 1,300 μ mos
- **Cutoff Bias (approximate, for a plate current of 50 μ A):** -1.5 V

Design-Maximum Ratings

The Design-Maximum Rating System defines the absolute limits within which the tube must be operated to ensure reliability and longevity. These ratings are independent of the specific circuit operating point.

Parameter	Pentode Section	Triode Section
Maximum Plate Voltage	330 V	330 V
Maximum Screen Supply Voltage	330 V	—
Maximum Screen Voltage	See Screen Rating Chart	—
Maximum Positive DC Grid No. 1 Voltage	0 V	0 V
Maximum Plate Dissipation	3.0 W	0.55 W
Maximum Screen Dissipation	0.55 W	—

Screen Dissipation Boundary

For the pentode section, the maximum screen dissipation is rated at 0.55 W for screen voltages up to 165 V. For screen voltages between 165 V and 330 V, the permissible screen dissipation decreases linearly

from 0.55 W down to 0 W at 330 V.

Maximum Grid-No. 1 Circuit Resistance

To prevent thermal runaway and maintain bias stability, the maximum resistance in the control grid circuit must not exceed the following values:

- **Pentode Section:** 0.25 M Ω for fixed-bias operation; 1.0 M Ω for cathode-bias operation.
- **Triode Section:** 0.5 M Ω for fixed-bias operation; 1.0 M Ω for cathode-bias operation.

Interelectrode Capacitances

The direct interelectrode capacitances of the 19HV8 are documented both with and without an external shield. When shielded measurements are specified, they are performed with an external shield (such as EIA 315) connected to the cathode of the section under test.

Pentode Section Capacitances

- **Grid No. 1 to Plate:** 0.007 pF (shielded); 0.016 to 0.019 pF (unshielded)
- **Input (Pg1 to h + Pk + Pg2 + Pg3 + IS):** 5.5 pF (shielded); 5.5 pF (unshielded)
- **Output (Pp to h + Pk + Pg2 + Pg3 + IS):** 3.4 pF (shielded); 2.4 pF (unshielded)
- **Heater to Cathode (with shield to ground):** 2.8 pF (shielded); 2.8 pF (unshielded)

Triode Section Capacitances

- **Grid to Plate:** 0.09 pF or 0.9 pF (reported consistently across different specifications as either 0.09 pF or 0.9 pF for both shielded and unshielded conditions)
- **Input (Tg to Tk + h + Pk + Pg3 + IS):** 1.9 pF (shielded); 1.7 pF (unshielded)
- **Output (Tp to Tk + h + Pk + Pg3 + IS):** 1.4 to 2.6 pF (shielded); 0.38 to 1.7 pF (unshielded)
- **Heater to Cathode (with shield to ground):** 2.8 pF (shielded); 2.8 pF (unshielded)

Technical Summary

The **19HV8** is a versatile, space-saving **miniature triode-pentode** designed for series-string radio receivers. It features a **18.9 V, 150 mA heater** and is housed in a **9-pin T-6 1/2 glass envelope** with a **9FA** pinout. The **sharp-cutoff pentode section** provides high transconductance (6,500 μ mhos) and high plate resistance (200,000 Ω) suitable for IF amplification, while the **high-mu triode section** ($\mu = 70$) is optimized for AF voltage amplification. By adhering to the Design-Maximum ratings—including a 330 V maximum plate limit and specific grid circuit resistance constraints—designers can reliably implement both gain stages within a single compact device.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Cathode Positive DC Component	100 V	—
Heater Cathode Positive Total Peak	200 V	—
Heater Cathode Negative Total Peak	200 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical Plate Voltage	125 V	—
Typical Screen Voltage	125 V	—
Typical Grid1 Voltage	-1 V	—
Typical Plate Current	12 mA	—
Typical Screen Current	4 mA	—

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Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Cathode Positive DC Component	100 V	—
Heater Cathode Positive Total Peak	200 V	—
Heater Cathode Negative Total Peak	200 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical Plate Voltage	100 V	—
Typical Grid1 Voltage	-1 V	—
Typical Plate Current	0.8 mA	—