



ELECTRONIC TUBE REFERENCE

12AH8

Voltage - Radio Detector Converter electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

HEPTODE-TRIODE

Brimar 12AH8 indirectly heated triode-heptode radio frequency changer with common cathode, internally coupled oscillator grid, 6.3/12.6 V center-tapped heater and B9A base.

GENERAL CHARACTERISTICS

BASE DESIGNATION	B9A	BASE PINS	9
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	6.3 V / 300 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	4850 Ω
TRANSCONDUCTANCE	0.0035 S
AMPLIFICATION FACTOR	17
MAXIMUM PLATE VOLTAGE	150 V
MAXIMUM PLATE DISSIPATION	0.75 W
Brimar 12AH8 triode oscillator section, maximum anode 150 V and dissipation 0.75 W. At V_a 100 V, V_g 0 V: I_a approx 14.6 mA, r_p 4850 Ω, g_m 0.0035 A/V, μ 17. Typical oscillator anode voltage 100 V from 100/250 V supplies (series resistor 0/27 kΩ), oscillator grid current 200 μA with 47 kΩ grid resistor. Common cathode with heptode, grid internally linked to heptode grid3. Shielded input 7 pF, output 2.5 pF, C_{gp} 1.2 pF.	

SECTION2 Heptode	
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM SCREEN VOLTAGE	125 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM SCREEN DISSIPATION	1.25 W
MAXIMUM CATHODE CURRENT	17.5 mA
<i>Brimar 12AH8 heptode frequency changer section. Maximum anode 300 V, dissipation 1.5 W, screen g2+g4 voltage 125 V and dissipation 1.25 W. Total common cathode current max 17.5 mA (shared with triode; section field denotes total tube limit). Typical at Va 100/250 V, screen 100 V, signal grid -3 V: Ia 2.5/2.6 mA, screen 4.5/4.4 mA, conversion conductance 0.00052/0.00055 A/V (not conventional gm), conversion impedance 0.6/1.5 MΩ. RF input 5 pF, IF output 8 pF, heptode grid-anode 0.025 pF max, grid to triode anode 0.1 pF, grid to triode grid 0.2 pF. Grid3 internally linked to triode grid; common cathode and suppressor grid5.</i>	

12AH8 — Miniature Triode-Heptode Frequency Changer

An indirectly heated, multi-unit miniature valve designed for frequency changer service, featuring a center-tapped heater for flexible supply configurations.

Overview

The **12AH8** is a miniature triode-heptode frequency changer designed for use in radio receivers. Produced as a current equipment type by Brimar, it is constructed on a B9A (Noval) nine-pin miniature base. The tube is characterized by high conversion conductance, high conversion impedance, and high oscillator mutual conductance.

A key design feature of the 12AH8 is its center-tapped heater. This configuration allows the heater to be operated from either a 6.3 V or a 12.6 V supply, making the valve highly versatile and suitable for integration into both AC-only equipment and series-string AC/DC receivers.

Physical Specifications and Pinout

The 12AH8 is housed in a standard miniature glass envelope with a maximum overall diameter of 7/8 inch (0.875 in) and a maximum seated height of 2 3/8 inches (2.375 in).

The B9A (Noval) base provides independent connections for the triode and heptode sections, with the exception of the cathode, which is shared. The pin connections, viewed from the underside of the base, are assigned as follows:

Pin Number	Electrode Connection
1	Heptode Anode (a_h)

Pin Number	Electrode Connection
2	Heptode Grids 2 and 4 (g_2, g_4)
3	Heptode Grid 1 (g_1h)
4	Heater (h)
5	Heater (h)
6	Triode Anode (a_t)
7	Triode Grid (g_t)
8	Cathode, Heptode Grid 5, and Internal Shield (k, g_5, s)
9	Heater Tap (h_tap)

The center tap on Pin 9 divides the heater coil, enabling two distinct operating modes:

- **6.3 V Operation:** The heater supply is connected across Pins 4 and 5 connected together, and Pin 9. This configuration draws a nominal current of 0.3 A.
- **12.6 V Operation:** The heater supply is connected across Pins 4 and 5, leaving Pin 9 unused or acting as the center tap. This configuration draws a nominal current of 0.15 A.

Maximum Ratings

To ensure reliable operation and prevent premature failure, the electrical operating conditions must not exceed the following absolute maximum ratings:

- **Heptode Anode Voltage (V_ah):** 300 V max
- **Heptode Screen (g_2, g_4) Voltage (V_g2,g4):** 125 V max
- **Triode Anode Voltage (V_at):** 150 V max
- **Total Cathode Current (I_k):** 17.5 mA max

Operating Characteristics

The 12AH8 is typically operated under one of two standard conditions, depending on the available supply voltages. The following table details these typical operating points:

Parameter	Condition I	Condition II
Heptode Anode Voltage	100 V	250 V
Heptode Anode Current	2.5 mA	2.6 mA
Heptode Screen Voltage	100 V	100 V

Parameter	Condition I	Condition II
Heptode Screen Current	4.5 mA	4.4 mA
Signal Grid (g _{1h}) Voltage	-3 V	-3 V
Cathode Bias Resistor	220 ohms	220 ohms
Heptode Anode Impedance	0.6 Mohms	1.5 Mohms
Triode Anode Supply Voltage	100 V	250 V
Triode Anode Resistor	0 ohms	27,000 ohms
Triode Anode Voltage	100 V	100 V
Triode Anode Current	5.7 mA	5.7 mA
Triode Grid Current	0.2 mA	0.2 mA
Triode Grid Resistor	47 kilohms	47 kilohms
Conversion Conductance	0.52 mA/V	0.55 mA/V
Conversion Conductance (at V _{g1} = -22 V)	0.005 mA/V	0.005 mA/V
Equivalent Noise Resistance (approx.)	100,000 ohms	100,000 ohms

Additionally, the triode section exhibits the following characteristics when measured independently at an anode voltage (V_{at}) of 100 V and a grid voltage (V_{gt}) of 0 V:

- **Triode Mutual Conductance (g_m):** 3.5 mA/V
- **Triode Amplification Factor (mu):** 17

Inter-electrode Capacitances

When operated with an external, close-fitting shield, the 12AH8 exhibits the following capacitances between its internal electrodes:

- **R.F. Input (g_{1h} to all except a_h):** 5.0 pF
- **I.F. Output (a_h to all except g_{1h}):** 8.0 pF
- **Triode Input:** 7.0 pF
- **Triode Output:** 2.5 pF
- **Heptode Grid to Heptode Anode (g_{1h} to a_h):** 0.025 pF
- **Triode Grid to Triode Anode (g_t to a_t):** 1.2 pF

Performance Curves and Analysis

The relationship between the oscillator grid current (I_{gt}) and the conversion performance of the heptode section is highly dependent on the operating voltages. Under typical operating conditions—with the heptode signal grid voltage (V_{g1h}) held at -3 V, the heptode screen voltage ($V_{g2,g4}$) at 100 V, the triode anode voltage (V_{at}) at 100 V, and a triode grid resistor (R_{gt}) of 47 kilohms—the following behaviors are observed:

Conversion Conductance (g_c)

- **At $V_{ah} = 250$ V:** The conversion conductance starts at approximately 100 microamps/V at very low oscillator grid current. It rises steeply as the oscillator grid current increases, reaching a peak value of approximately 550 microamps/V (0.55 mA/V) when the oscillator grid current is in the range of 150 microamps to 200 microamps. Beyond this peak, the conductance declines slightly, settling near 500 microamps/V at an oscillator grid current of 300 microamps.
- **At $V_{ah} = 100$ V:** The conversion conductance curve follows a nearly identical trajectory but peaks slightly lower, reaching a maximum of approximately 520 microamps/V (0.52 mA/V) within the same 150 microamps to 200 microamps oscillator grid current range.

Conversion Impedance (r_c)

- **At $V_{ah} = 250$ V:** The conversion impedance increases steadily with the oscillator grid current. It starts at approximately 0.6 Mohms at low current levels and rises to about 1.5 Mohms as the oscillator grid current approaches 300 microamps.
- **At $V_{ah} = 100$ V:** The conversion impedance remains relatively flat and low, staying around 0.6 Mohms across the entire range of oscillator grid current from 0 to 300 microamps.

These curves demonstrate that operating the heptode anode at a higher voltage (250 V instead of 100 V) significantly improves the conversion impedance at higher oscillator grid currents, while maintaining a slightly higher peak conversion conductance.

Technical Summary

The **12AH8** is a high-performance, B9A-based miniature triode-heptode frequency changer. Its dual-voltage heater design (6.3 V at 0.3 A or 12.6 V at 0.15 A) provides excellent flexibility for different power supply topologies. The heptode section offers a conversion conductance of up to 0.55 mA/V and a high conversion impedance of up to 1.5 Mohms under optimal operating conditions. The triode section, designed primarily for oscillator service, features a mutual conductance of 3.5 mA/V and an amplification factor of 17. With its low inter-electrode capacitances and robust electrical ratings, the 12AH8 serves as an efficient and reliable frequency changer in superheterodyne radio receivers.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1958 Brimar Radio Valve No 7

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

1958 BRIMAR RADIO VALVE NO 7

Section 1 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage	12.6 V	—
Heater Current	150 mA	—

1958 BRIMAR RADIO VALVE NO 7

Section 2 · Heptode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Conversion Conductance	750 μ S	FrequencyChanger

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