



ELECTRONIC TUBE REFERENCE

1AE5

Voltage - Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

HEPTODE

Battery or receiving-tube frequency converter combining local-oscillator and mixer action for superheterodyne radio service. Its multi-grid structure provides frequency conversion while minimizing component count and, in battery types, filament power.

GENERAL CHARACTERISTICS

BASE DESIGNATION	1AE5	BASE PINS	7
NOMINAL HEATER	1.25 V / 60 mA	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Heptode	
PLATE RESISTANCE	200000 Ω
TRANSCONDUCTANCE	0.0002 S
MAXIMUM PLATE VOLTAGE	45 V
MAXIMUM SCREEN VOLTAGE	45 V
Heptode mixer: Transconductance is conversion transconductance.	

1AE5 — Subminiature Heptode Mixer Tube

Overview

The **1AE5** is a subminiature heptode vacuum tube designed primarily for mixer service in low-power and portable applications. Featuring a filamentary cathode (DC) and a compact flat-press subminiature construction, the 1AE5 operates at low electrode voltages, making it highly suitable for battery-operated

equipment. Its electrode configuration includes a dedicated signal-input grid (Grid 3) and combined screen grids (Grids 2 and 4) to facilitate efficient frequency conversion.

Mechanical Construction and Pinout

The 1AE5 is built in a subminiature envelope with a flat-press structure. Its physical dimensions are highly compact, with a maximum overall length of 1.5 inches, a maximum width of 0.385 inches, and a maximum thickness of 0.300 inches. The tube utilizes a T-X outline drawing and a 6A terminal connection (also designated as the 1AE5 base connection).

The base connection features an inline, seven-pin arrangement. When viewed from left to right, the pinout configuration is as follows:

Pin Number	Connection	Function
Pin 1	F-	Filament Negative
Pin 2	G1	Grid 1 (Oscillator/Injection Grid)
Pin 3	G2, G4	Screen Grids
Pin 4	G3	Grid 3 (Signal-Input Grid)
Pin 5	G2, G4	Screen Grids
Pin 6	P	Plate
Pin 7	F+	Filament Positive

In this heptode structure, Grids 2 and 4 are internally connected and function together as the screen grid, while Grid 3 serves specifically as the signal-input grid.

Filament Ratings

The 1AE5 features a directly heated filamentary cathode designed for low-voltage DC operation. The filament ratings are optimized for battery efficiency:

- **Filament Voltage:** 1.25 V DC
- **Filament Current:** 60 mA (0.06 A)
- **Filament Type:** Filamentary Cathode (DC)

Maximum Ratings

To ensure reliable operation and prevent damage to the subminiature structure, the operating voltages of the 1AE5 must be kept within its maximum limits:

- **Maximum Plate Voltage:** 45 V

- **Maximum Screen Voltage (Grids 2 and 4):** 45 V

Typical Operation and Characteristics in Mixer Service

Under typical operating conditions as a heptode mixer, the 1AE5 is configured with low supply voltages and specific grid injection parameters. The typical operating point and resulting electrical characteristics are detailed below:

Operating Voltages and Currents

- **Plate Voltage:** 45 V
- **Screen Voltage (Grids 2 and 4):** 45 V
- **Grid 3 (Signal-Input Grid) Voltage:** 0 V
- **Plate Current:** 0.9 mA
- **Screen Current (Grids 2 and 4):** 2.0 mA

Oscillator and Injection Conditions

For proper mixer operation, the local oscillator signal is injected into Grid 1. The typical injection parameters are:

- **Grid 1 Resistance (R_{g1}):** 200,000 Ω (0.2 M Ω)
- **Grid 1 Injection Current (I_{g1}):** 15 μ A

Electrical Characteristics

- **Plate Resistance (R_p):** Approximately 200,000 Ω (0.2 M Ω)
- **Conversion Transconductance (G_c):** 200 μ mhos

The low conversion transconductance of 200 μ mhos is typical for subminiature heptodes operating at these very low plate and screen potentials, balancing conversion efficiency with minimal current drain.

Technical Summary

The **1AE5** is a subminiature heptode mixer featuring a directly heated 1.25 V, 60 mA filamentary cathode. Housed in a compact T-X flat-press envelope with a 7-pin inline base, it is optimized for low-voltage portable applications. With maximum plate and screen ratings of 45 V, the tube typically operates at 45 V on both the plate and screens, drawing a total cathode current of under 3 mA (0.9 mA plate current and 2.0 mA screen current). Under these conditions, with a Grid 1 injection current of 15 μ A through a 200,000 Ω resistor, it provides a conversion transconductance of 200 μ mhos and an approximate plate resistance of 200,000 Ω .

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 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	45 V	Converter
Screen voltage	45 V	Converter
Grid voltage	0 V	Converter
Plate current	0.9 mA	Converter
Screen current	2 mA	Converter
Injection-grid current	15 uA	Mixer
Injection-grid resistor	200000 ohm	Mixer

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X Raytheon Special Purpose Tubes

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

195X RAYTHEON SPECIAL PURPOSE TUBES

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	45 V	—
Grid 1 return resistance	0.2 megohm	—
Grid 2 voltage	45 V	—
Grid 3 voltage	0 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	0.9 mA	—
Grid 2 current	2 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	200000 ohm	—
Transconductance	200 uS	—

TUBE TINKER

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