

ELECTRONIC TUBE REFERENCE

1AF4

Voltage Pentode - Sharp Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
PENTODE

Ultra-low-drain directly heated sharp-cutoff pentode for battery-operated RF and small-signal voltage amplification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	6AR	BASE PINS	7
NOMINAL HEATER	1.4 V / 25 mA	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

6AR - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – G3	A	G3 – Suppressor Grid	CONNECTED
PIN1 – IS	A	IS – Internal Screen	CONNECTED
PIN1 – F	–	F – Filament	CONNECTED
PIN2 – P	A	P – Plate (Anode)	CONNECTED
PIN3 – G2	A	G2 – Screen Grid	CONNECTED
PIN4 – IC	–	–	IC
PIN5 – G3	A	G3 – Suppressor Grid	CONNECTED
PIN5 – IS	A	IS – Internal Screen	CONNECTED
PIN5 – F	–	F – Filament	CONNECTED
PIN6 – G1	A	G1 – Control Grid	CONNECTED
PIN7 – F	–	F – Filament	CONNECTED

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	1800000 Ω
TRANSCONDUCTANCE	0.00095 S
MAXIMUM PLATE VOLTAGE	110 V
MAXIMUM SCREEN VOLTAGE	90 V
MAXIMUM CATHODE CURRENT	2.5 mA
<i>Sharp-cutoff pentode.</i>	

1AF4 — Sharp-Cutoff Filamentary Pentode

The **1AF4** is a miniature, sharp-cutoff filamentary pentode designed primarily for use as an audio-frequency (AF) or radio-frequency (RF) voltage amplifier in portable receivers. It features a coated filament with extremely low power consumption, requiring only 1.4 V at 25 mA. This represents a 50% reduction in filament power compared to older vacuum tubes designed for similar portable services.

Physical and Mechanical Specifications

The 1AF4 is constructed in a small T-5 1/2 glass bulb with an Outline 5-2 designation. Its physical dimensions are as follows:

- **Maximum Diameter:** 3/4 inch
- **Maximum Overall Length:** 2 1/8 inches
- **Maximum Seated Height:** 1 7/8 inches
- **Base:** Miniature Button 7-Pin (E7-1)
- **Mounting Position:** Any

Pinout Configurations

The 1AF4 uses a 7-pin miniature base, designated under the 6AR (or 6AR-0-1&5) basing standard. However, three distinct pinout configurations are documented for this designation. Designers must verify the specific wiring of the physical device:

- **Configuration A:**
 - Pin 1: Filament Negative (F-), Grid No. 3 (G3), Internal Shield (IS)
 - Pin 2: Grid No. 1 (G1)
 - Pin 3: Grid No. 2 (G2)
 - Pin 4: No Connection (NC)
 - Pin 5: Filament Negative (F-), Grid No. 3 (G3), Internal Shield (IS)
 - Pin 6: Plate (P)
 - Pin 7: Filament Positive (F+)
- **Configuration B:**

- Pin 1: Filament Negative (F-), Grid No. 3 (G3), Internal Shield (IS)
- Pin 2: Plate (P)
- Pin 3: Grid No. 2 (G2)
- Pin 4: No Connection (NC)
- Pin 5: Filament Negative (F-), Grid No. 3 (G3), Internal Shield (IS)
- Pin 6: Grid No. 1 (G1)
- Pin 7: Filament Positive (F+)
- **Configuration C:**
 - Pin 1: Filament Negative (F-)
 - Pin 2: Grid No. 3 (G3)
 - Pin 3: Filament Positive (F+)
 - Pin 4: Grid No. 1 (G1)
 - Pin 5: Grid No. 2 (G2)
 - Pin 6: Plate (P)
 - Pin 7: Filament Negative (F-)

Filament Ratings

The 1AF4 utilizes a directly heated, coated filament designed for battery or power-line operation. For power-line operation, the filament voltage is centered at 1.4 V for a normal 117 V line.

- **Filament Voltage:** 1.4 V (AC or DC)
- **Filament Current:** 25 mA (0.025 A)
- **Filament Power (Calculated):** $1.4 \text{ V} \times 0.025 \text{ A} = 0.035 \text{ W}$ (35 mW)

Maximum Ratings

The maximum ratings for the 1AF4 are established under the Design Center / Design-Maximum systems (RMA Standard M8-210):

- **Maximum Plate Voltage (DC):** 110 V
- **Maximum Grid No. 2 (Screen) Supply Voltage (DC):** 110 V
- **Maximum Grid No. 2 (Screen) Voltage (DC):** 90 V
- **Maximum Positive Grid No. 1 (Control Grid) Voltage (DC):** 0 V
- **Maximum Cathode Current:** 2.5 mA

Electrical Characteristics and Typical Operation

The 1AF4 operates as a Class A (or Class A1) amplifier. The typical operating characteristics are documented under two primary voltage conditions. Depending on the manufacturer's specifications, there are slight variations in the typical currents, plate resistance, and transconductance values.

Typical Operating Conditions

Parameter	Condition 1 (Low Voltage)	Condition 2 (High Voltage)
Plate Voltage	67.5 V	90 V
Grid No. 2 (Screen) Voltage	67.5 V	90 V
Grid No. 1 (Control Grid) Voltage	0 V	0 V
Plate Current	1.0 mA to 1.2 mA	1.65 mA to 1.8 mA
Grid No. 2 Current	0.3 mA to 0.32 mA	0.5 mA to 0.55 mA
Plate Resistance (approx.)	2.0 MΩ to 2.2 MΩ	1.8 MΩ
Transconductance	825 %mhos to 925 %mhos	950 %mhos to 1050 %mhos
Grid No. 1 Cutoff Voltage (for Gm = 10 %mhos)	-2.5 V	-3.5 V

Interelectrode Capacitances

The direct interelectrode capacitances of the 1AF4 are extremely low, making it highly suitable for RF amplification. These values are documented both with and without an external shield (specifically Shield #316, which is connected to Pins 1 and 5 when used):

- **Grid No. 1 to Plate (max):**
 - Without Shield: 0.008 pF to 0.009 pF
 - With Shield: 0.008 pF
- **Input (G1 to [F + G2 + G3 + IS]):**
 - Without Shield: 3.8 pF
 - With Shield: 3.8 pF
- **Output (P to [F + G2 + G3 + IS]):**
 - Without Shield: 7.5 pF to 7.6 pF
 - With Shield: 7.6 pF

Technical Summary

The **1AF4** is a highly efficient, sharp-cutoff filamentary pentode designed for portable receiver applications. By drawing only 25 mA at 1.4 V, it minimizes battery drain in portable equipment. It provides high plate resistance (up to 2.2 MΩ) and moderate transconductance (up to 1050 %mhos) under typical Class A operating conditions. With its low interelectrode capacitances and compact T-5 1/2 miniature envelope, the 1AF4 serves as an effective voltage amplifier for both RF and AF stages.



SOURCE OPERATING CONDITIONS

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1950 Sylvania

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

1950 SYLVANIA

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Typical plate voltage	90 V	—
Typical plate current	1.1 mA	—



SOURCE OPERATING CONDITIONS

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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	3.8 pF	—
Output capacitance	7.6 pF	—
Grid-to-plate capacitance	0.009 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	90 V	ClassA
Screen voltage	90 V	ClassA
Grid voltage	0 V	ClassA

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	1.8 mA	ClassA
Screen current	0.55 mA	ClassA
Plate voltage	67.5 V	ClassA
Screen voltage	67.5 V	ClassA
Grid voltage	0 V	ClassA
Plate current	1.2 mA	ClassA
Screen current	0.32 mA	ClassA
Plate resistance	2200000 ohm	ClassA
Transconductance	925 uS	ClassA



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	90 V	ClassA
Grid 2 voltage	90 V	ClassA

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to plate	0.008 pF	—