



ELECTRONIC TUBE REFERENCE

1AD4

Voltage Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
PENTODE

Directly heated subminiature sharp-cutoff pentode for AF and RF voltage amplification in compact battery-powered equipment.

GENERAL CHARACTERISTICS

BASE DESIGNATION	1AD4	BASE PINS	7
NOMINAL HEATER	1.25 V / 100 mA	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
TRANSCONDUCTANCE	0.0026 S
AMPLIFICATION FACTOR	18
MAXIMUM PLATE VOLTAGE	90 V
MAXIMUM SCREEN VOLTAGE	90 V
MAXIMUM PLATE DISSIPATION	0.55 W
MAXIMUM SCREEN DISSIPATION	0.2 W
MAXIMUM CATHODE CURRENT	8.5 mA
<i>Fully shielded directly heated sharp-cutoff RF pentode for battery-operated equipment; supplied sheet explicitly co-designates DF62/1AD4.</i>	

1AD4 — Sharp-Cutoff Subminiature Pentode

A directly heated, fully shielded subminiature pentode designed for radio-frequency (RF) and audio-frequency (AF) amplification in battery-operated and portable electronic equipment.

Overview

The **1AD4** (also designated as the **DF 62**) is a subminiature sharp-cutoff pentode featuring a directly heated filament. It is specifically engineered for low-power, portable, and battery-operated applications, serving as an RF or AF amplifier. The tube is constructed with a fully shielded glass envelope and flexible leads, allowing it to be soldered directly into circuits or used with standard inline subminiature sockets.

With a nominal filament supply of **1.25 V** at **100 mA**, the 1AD4 provides efficient operation from single-cell batteries. Its design incorporates a built-in metallic shield and a dual-plate suppressor grid configuration to optimize high-frequency performance and minimize interelectrode coupling.

Construction, Physical Dimensions, and Installation

The 1AD4 is housed in a subminiature glass envelope (such as the T-2x3 or A 7x 10.1 outline) with a flat-press base. The bulb is entirely coated with a conductive metallic shield to provide built-in electrical shielding.

Physical Dimensions

- **Maximum Body Length:** 38.1 mm (1.5 in.)
- **Maximum Width:** 9.78 mm (0.385 in.)
- **Maximum Thickness / Diameter:** 7.24 mm (0.285 in.)
- **Minimum Lead Length:** 38.1 mm (1.5 in.)

Installation Precautions

The 1AD4 features five flexible, tinned leads (0.016-inch diameter) spaced 0.048 inches center-to-center. These leads can be soldered or welded directly to circuit components. When soldering, great care must be taken to avoid overheating the glass-to-metal seal. Additionally, leads should not be bent closer than 2 mm from the glass-to-metal seal to prevent mechanical stress and potential envelope failure. The tube can be mounted in **any position**.

Suppressor Grid and Shielding Configuration

The suppressor grid (Grid 3) consists of two separate plates. To optimize shielding and electron flow, one plate is internally connected to the negative filament terminal (which also connects to the external conductive envelope coating), while the other plate is connected to the positive filament terminal.

Pinout and Terminal Connections

Depending on the manufacturer and the specific standard applied (such as the 5A or 7L7 base configurations), two distinct pinout arrangements exist for the 1AD4. In both configurations, a red or colored dot on the glass envelope indicates the position of Lead 1.

Standard Configuration (DF 62 / 1AD4)

In this layout, the leads are arranged in-line from 1 to 5:

- **Lead 1:** Anode (Plate) — indicated by the red dot
- **Lead 2:** Grid 2 (Screen Grid)
- **Lead 3:** Negative Filament ($-f$), Suppressor Grid (Grid 3 plate), and Conductive Shield Coating
- **Lead 4:** Grid 1 (Control Grid)
- **Lead 5:** Positive Filament ($+f$) and Suppressor Grid (Grid 3 plate)

Alternative Configuration (5-Lead Flat-Press)

An alternative terminal connection scheme is documented for certain subminiature flat-press versions:

- **Lead 1:** Negative Filament ($-f$)
- **Lead 2:** Grid 1 (Control Grid)
- **Lead 3:** Grid 2 (Screen Grid)
- **Lead 4:** Grid 3 (Suppressor Grid)
- **Lead 5:** Plate (Anode)

Filament Ratings

The 1AD4 utilizes a directly heated filament designed for DC operation. The filament can be operated in parallel supply configurations.

Filament Parameter	Value
Nominal Filament Voltage (V_f)	1.25 V DC
Nominal Filament Current (I_f)	100 mA (0.1 A)
Absolute Minimum Filament Voltage	1.00 V
Absolute Maximum Filament Voltage	1.50 V (or 1.25 V $\pm$ 20%)

Electrical Characteristics and Operating Points

The 1AD4 operates as a Class A (or Class A1) amplifier. It exhibits high transconductance and high plate resistance at low operating voltages. The published typical operating conditions are divided into 45 V and 90 V regimes:

Typical Operating Conditions

Parameter	45 V Operating Point	90 V Operating Point
Anode Voltage (V_a)	45 V	90 V
Grid 2 Voltage ($V_{[g2]}$) ($/tubes/G2$)	45 V	90 V

Parameter	45 V Operating Point	90 V Operating Point
Grid 1 Voltage (V_{g1})	0 V	-1.6 V
Grid 1 Series Resistor (R_{g1})	2 M Ω	—
Anode Current (I_a)	2.8 mA to 3.3 mA	5.7 mA
Grid 2 Current ($I_{[g2]}$)(/tubes/G2))	0.8 mA to 0.9 mA	1.5 mA
Plate Resistance (R_p)	0.4 M Ω to 0.5 M Ω (200 k Ω min)	0.5 M Ω
Transconductance (g_m)	2000 μ mhos to 2200 μ mhos (2.0 to 2.2 mA/V)	2600 μ mhos (2.6 mA/V)
Amplification Factor (μ_{g2g1})	17.5	18
Grid Bias for Cut-off	-3.5 V to -3.8 V (at $g_m = 10$ μ mhos)	-7.0 V (at $g_m = 10$ μ mhos)

Maximum Ratings

The maximum ratings of the 1AD4 vary depending on the rating system applied (Absolute Maximum Rating System vs. Design Centre Rating System) and the specific manufacturer specifications.

Parameter	Absolute Maximum (Low Limit)	Absolute Maximum (High Limit)	Design Centre Limit
Anode Voltage (V_a)	45 V	100 V	90 V
Grid 2 Voltage ($V_{[g2]}$)(/tubes/G2))	45 V	100 V	90 V
Anode Dissipation (W_a)	—	0.3 W	0.55 W
Grid 2 Dissipation ($W_{[g2]}$)(/tubes/G2))	—	0.1 W	0.2 W
Total Cathode Current (I_k)	—	5.5 mA to 7.0 mA	8.5 mA
Grid 1 Circuit Resistance (R_{g1})	—	2 M Ω	2 M Ω
Maximum Operating Altitude	—	3000 m (without pressurization)	—

Note on Voltage Limits: Under certain military specifications (such as MIL-E-1B), standard clauses permitting maximum plate and screen voltage ratings to be exceeded are explicitly designated as non-applicable to the 1AD4.

Interelectrode Capacitances

The direct interelectrode capacitances of the 1AD4 depend on whether an external shield is utilized. The internal conductive coating connected to Lead 3 provides significant shielding when grounded.

- **With External Shield / Grounded Conductive Coating:**

- **Input Capacitance (C_{in}):** 4.0 pF
- **Output Capacitance (C_{out}):** 4.0 pF
- **Grid 1 to Anode ($C_{g1/a}$):** < 0.01 pF (10 mpF max)

- **Without External Shield:**

- **Input Capacitance (C_{in}):** 4.5 pF
- **Output Capacitance (C_{out}):** 4.5 pF
- **Grid 1 to Anode ($C_{g1/a}$):** 0.01 pF

Qualitative Curve Observations

Transfer Characteristics

At an operating voltage of $V_a = V_{[g2]}(/tubes/G2) = 45$ V, the transfer curves show a smooth, continuous reduction of transconductance (g_m), anode current (I_a), and screen current ($I_{[g2]}(/tubes/G2)$) as the grid bias (V_{g1}) sweeps from 0 V down to -4 V. The sharp-cutoff behavior is clearly defined, with the tube reaching near-complete cutoff around -3.5 V to -4.0 V.

Plate Characteristics (Pentode Connection)

The pentode plate curves (plotted up to 140 V with $V_{[g2]}(/tubes/G2) = 45$ V) display typical pentode knee behavior occurring below 15 V of anode voltage. Above this knee, the plate current curves (I_b) form flat plateaus extending up to 120 V and higher, for grid biases ranging from 0 V down to -2.5 V, as well as positive grid biases up to $+5$ V. The screen current ($I_{[g2]}(/tubes/G2)$) decreases as the plate voltage increases, which is characteristic of partition noise and current distribution changes between the screen grid and anode at low plate potentials.

Plate Characteristics (Triode Connection)

When triode-connected, the average plate characteristics show typical triode behavior. The plate current increases smoothly with rising plate voltage, reaching up to 6.0 mA at a filament voltage of 1.25 V DC, as the grid voltage ($V_{[c1]}(/tubes/C1)$) is stepped from 0 V down to -8.0 V.

Technical Summary

The **1AD4** (DF 62) is a **subminiature, directly heated sharp-cutoff pentode** designed for low-voltage RF and AF amplification in portable, battery-powered equipment. Operating with a **1.25 V, 100 mA** filament, it delivers a transconductance of **2000 μmhos** to **2200 μmhos** at a typical plate and screen potential of **45 V**, which rises to **2600 μmhos** at **90 V**.

Its physical construction features a fully shielded glass envelope with a conductive coating connected to the negative filament, and a suppressor grid split into two plates connected across the filament supply. With its flexible leads, the 1AD4 can be soldered directly into compact assemblies, offering reliable high-frequency performance, low interelectrode capacitance (grid-to-plate capacitance $< 0.01 \text{ pF}$), and sharp-cutoff characteristics.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1938 Raytheon

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

1938 RAYTHEON

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament Voltage (dc)	54321 volts	Filament Voltage (dc) 1.25± 20% volts 54321
Plate Voltage	100 volts	Plate Voltage 100 volts
Grid #	100 volts	Grid #2 Voltage 100 volts
Plate Dissipation	0.3 watt	Plate Dissipation 0.3 watt
Grid #	0.1 watt	Grid #2 Dissipation 0.1 watt
Total Cathode Current	5.5 ma	Total Cathode Current 5.5 ma.

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament Voltage (dc)	1.25 volts	Filament Voltage (dc) 1.25 volts
Filament Current	0.1 amps	Filament Current 0.10 amps.
Plate Voltage	45 volts	Plate Voltage 45 volts
Grid #	45 volts	Grid #2 Voltage 45 volts
Grid #	0 volts	Grid #1 Voltage @ 0 volts
Plate Resistance (approx.)	0.5 meg	Plate Resistance (approx.) 0.5 meg.
Transconductance	0 pmhos	Transconductance 2G00 pmhos
Plate Current	3 ma	Plate Current 3.0 'ma.
Grid #	0.9 ma	Grid #2 Current 0.9 ma.
Grid #	2.5 umhos	Grid #1 Voltage (approx.) for Gm= 10 umhos 2.5 volts
Ef=	1.25 Vdc	Ef=1.25 Vdc

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	4.5 pF	—
Output capacitance	4.5 pF	—
Grid-to-plate capacitance	0.01 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	45 V	ClassA
Screen voltage	45 V	ClassA
Grid resistor	2 Mohm	ClassA
Plate current	3 mA	ClassA
Screen current	0.8 mA	ClassA



SOURCE DATA APPENDIX

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 · Pentode

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

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	2.8 mA	—
Grid 2 current	0.8 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	500000 ohm	—
Transconductance	2000 uS	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Philips Electron Tubes Handbook V1

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

1963 PHILIPS ELECTRON TUBES HANDBOOK V1

Section 1 · Pentode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	—0.01 pF	—
Plate capacitance	4 pF	—
Control-grid capacitance	4 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	90 V	RF amplifier
Screen voltage	90 V	RF amplifier
Plate current	5.7 mA	RF amplifier
Screen current	1.5 mA	RF amplifier

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	2600 uS	—
Plate resistance	0.5 Mohm	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cutoff grid voltage	-7 V	S=10uA/V


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1968 Mazda Belvu

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

1968 MAZDA BELVU

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	3 mA	Plate 45 V;Screen 45 V


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1999 Philips 0-D

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

1999 PHILIPS 0-D

Section 1 · Pentode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate-grid capacitance maximum	0.01 pF	—
Input capacitance	4 pF	—

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	45 V	—
Screen voltage	45 V	—
Plate current	3.3 mA	—
Screen current	0.9 mA	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	2200 μ S	—
Plate resistance	0.4 Mohm	—
Screen-grid amplification factor	17.5	—