



## ELECTRONIC TUBE REFERENCE

## 1AH4

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

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Fully shielded subminiature directly heated RF pentode designed for low-drain battery equipment. Its compact construction and economical filament requirements suit portable high-frequency signal-amplifier applications where power consumption and space are restricted.

## GENERAL CHARACTERISTICS

|                     |                   |                      |               |
|---------------------|-------------------|----------------------|---------------|
| BASE DESIGNATION    | 1AD4              | BASE PINS            | 7             |
| NOMINAL HEATER      | 1.25 V / 40 mA    | PARALLEL HEATER      | – / –         |
| HEATING             | Direct            | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes | SECTION CONSTRUCTION | Similar       |

## SECTION RATINGS

|                                                                                                                                                  |                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| SECTION1 Pentode                                                                                                                                 |                  |
| PLATE RESISTANCE                                                                                                                                 | 2000000 $\Omega$ |
| TRANSCONDUCTANCE                                                                                                                                 | 0.00075 S        |
| MAXIMUM PLATE VOLTAGE                                                                                                                            | 90 V             |
| MAXIMUM SCREEN VOLTAGE                                                                                                                           | 90 V             |
| MAXIMUM CATHODE CURRENT                                                                                                                          | 2 mA             |
| <i>Promoted from the printed condensed-manual maximum/characteristic columns; operating-point values are retained in TUBE_SECTION_PARAMETER.</i> |                  |

## 1AH4 — Subminiature RF Pentode

*A filament-type, fully shielded subminiature pentode designed for radio-frequency applications where space, weight, and battery power drain must be minimized.*

# Overview

The **1AH4** is a subminiature pentode designed primarily for radio-frequency (RF) amplification in portable, battery-operated equipment. It features a coated filament and a specialized suppressor grid (Grid #3) construction consisting of two separate deflector plates. To ensure stable high-frequency operation in compact layouts, the tube is fully shielded with an integral metallic envelope coating.

## Mechanical Construction and Base Configuration

The 1AH4 is constructed in a T-2x3 subminiature glass bulb. The entire exterior of the bulb is coated with a metallic shield that is internally connected to lead 3, eliminating the need for an external shielding canister.

The tube features a flat subminiature base with five tinned flexible leads, each measuring 0.016 inches in diameter. The leads are arranged with a center-to-center spacing of 0.05 inches. A red indexing dot is located on the bulb adjacent to lead 1 to identify the pin sequence.

## Physical Dimensions

- **Maximum Bulb Length:** 1.5 inches (1-1/2")
- **Minimum Lead Length:** 1.5 inches (1-1/2")
- **Maximum Width:** 0.385 inches
- **Maximum Thickness:** 0.285 inches

## Installation and Mounting

The flexible leads are designed to be soldered or welded directly to circuit components, which is ideal for ultra-compact assemblies. For applications utilizing standard subminiature sockets, the leads can be cut to a length of 0.20 inches. The tube can be mounted and operated in any physical position.

## Pinout and Electrode Connections

The terminal connections, viewed from the bottom of the tube, correspond to the 5A or 1AD4 base connection scheme:

| Lead Number | Connection                                   | Description                                                                                                   |
|-------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Lead 1      | Plate (P)                                    | Anode                                                                                                         |
| Lead 2      | Grid #2 ( $G_2$ )                            | Screen Grid                                                                                                   |
| Lead 3      | Filament Negative ( $F^-$ ) / Shield / $G_3$ | Connected to negative filament leg, metallic bulb shield, and one of the separate deflector plates of Grid #3 |
| Lead 4      | Grid #1 ( $G_1$ )                            | Control Grid                                                                                                  |

| Lead Number | Connection                          | Description                                                                  |
|-------------|-------------------------------------|------------------------------------------------------------------------------|
| Lead 5      | Filament Positive ( $F_+$ ) / $G_3$ | Connected to positive filament leg and the second deflector plate of Grid #3 |

The suppressor grid (Grid #3) is unique in that it consists of two separate deflector plates rather than a single tied structure. One plate is connected to the negative filament terminal (Lead 3) along with the metallic envelope shield, while the other plate is connected to the positive filament terminal (Lead 5).

## Filament and Absolute Maximum Ratings

The 1AH4 is designed for low-power battery operation. Its filament is a coated type designed for DC or AC operation.

### Filament Specifications

- **Filament Voltage:** 1.25 V (nominal)
- **Filament Current:** 0.04 A (40 mA)
- **Filament Supply Type:** AC or DC

### Design Center Maximum Ratings

These ratings are interpreted according to the RMA Standard MB-210 (or M8-210) convention:

- **Maximum Plate Voltage:** 90 V
- **Maximum Grid #2 (Screen) Voltage:** 90 V
- **Maximum Total Cathode Current:** 2.0 mA

## Direct Interelectrode Capacitances

The capacitances of the 1AH4 are extremely low, reflecting its design as an RF amplifier. These values are measured with the integral metallic shield connected to lead 3:

- **Grid to Plate (Maximum):** 0.01 pF
- **Input Capacitance:** 3.5 pF
- **Output Capacitance:** 4.5 pF

These low capacitances, particularly the very small grid-to-plate feedback capacitance, are critical for stable high-frequency amplification without self-oscillation.

## Typical Operating Conditions and Characteristics

The 1AH4 operates as a Class  $A_1$  amplifier. The specifications outline two typical operating conditions: one with a fixed screen voltage and another utilizing a screen-dropping resistor. In both cases, the control

grid ( $G_1$ ) is returned to ground or the negative filament terminal through a high-value grid resistor ( $R_{g1}$ ) of 5 Megohms, resulting in a nominal grid bias of 0 V.

## Class A<sub>1</sub> Amplifier Operating Parameters

| Parameter                          | Condition I (Fixed Screen) | Condition II (Screen Resistor) |
|------------------------------------|----------------------------|--------------------------------|
| Filament Voltage                   | 1.25 V                     | 1.25 V                         |
| Filament Current                   | 0.04 A                     | 0.04 A                         |
| Plate Voltage                      | 45 V                       | 67.5 V                         |
| Grid #2 (Screen) Voltage           | 45 V                       | —                              |
| Grid #2 Supply Voltage             | —                          | 67.5 V                         |
| Grid #2 Series Resistor            | —                          | 0.1 MΩ                         |
| Grid #1 Bias Voltage               | 0 V                        | 0 V                            |
| Grid #1 Resistor ( $R_{g1}$ )      | 5 MΩ                       | 5 MΩ                           |
| Plate Resistance ( $r_p$ )         | 1.5 MΩ                     | 2.0 MΩ                         |
| Transconductance ( $g_m$ )         | 750 mhos                   | 750 mhos                       |
| Plate Current ( $I_b$ )            | 0.75 mA                    | 0.75 mA                        |
| Grid #2 Current ( $I_{c2}$ )       | 0.2 mA                     | 0.2 mA                         |
| Grid #1 Cutoff Voltage (Approx.) * | -3.0 V                     | -3.5 V                         |

## Analysis of Operating Conditions

In Condition I, the screen grid is fed directly from a 45 V source. In Condition II, a higher supply voltage of 67.5 V is used for both the plate and the screen circuit, with a 0.1 MΩ series resistor dropping the screen voltage. Under both conditions, the tube draws a very low plate current of 0.75 mA and a screen current of 0.2 mA. This results in a total cathode current of 0.95 mA, which is well within the design center maximum limit of 2.0 mA.

The transconductance remains constant at 750 mhos in both configurations, while the plate resistance increases from 1.5 MΩ to 2.0 MΩ when operating at the higher plate voltage of 67.5 V. The higher plate resistance in Condition II provides a slight advantage in stage gain and selectivity when coupled to high-impedance RF tuned circuits.

## Technical Summary

The **1AH4** is a highly specialized, subminiature RF pentode featuring a coated filament that operates at **1.25 V** and **40 mA**. Its physical design includes an integrated metallic envelope shield and a flat five-lead base, allowing for direct soldering into compact, lightweight, battery-powered equipment.

Electrically, the 1AH4 is characterized by its low power consumption, drawing less than 1 mA of total cathode current under typical Class *A*<sub>1</sub> operating conditions. It provides a transconductance of **750** ~~/~~**μhos** and a high plate resistance of **1.5 to 2.0 MΩ** at plate voltages of 45 to 67.5 V. With a maximum plate and screen rating of **90 V** and an exceptionally low grid-to-plate capacitance of **0.01** ~~F~~**F**, the 1AH4 serves as an efficient and stable voltage amplifier for portable radio-frequency applications.

## 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 · Pentode

| CAPACITANCE               |                 |                  |
|---------------------------|-----------------|------------------|
| PARAMETER                 | PUBLISHED VALUE | CONDITION / NOTE |
| Input capacitance         | 3.5 pF          | Section1         |
| Output capacitance        | 4.5 pF          | Section1         |
| Grid-to-plate capacitance | 0.01 pF         | Section1         |

| OTHER          |                 |                  |
|----------------|-----------------|------------------|
| PARAMETER      | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage  | 45 V            | ClassA           |
| Screen voltage | 45 V            | ClassA           |
| Plate current  | 0.75 mA         | ClassA           |
| Screen current | 0.2 mA          | ClassA           |

| CHARACTERISTIC   |                  |                  |
|------------------|------------------|------------------|
| PARAMETER        | PUBLISHED VALUE  | CONDITION / NOTE |
| Plate resistance | 1500000 $\Omega$ | ClassA           |
| Transconductance | 750 $\mu$ S      | ClassA           |

## 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 · Pentode

| OTHER                    |                 |                  |
|--------------------------|-----------------|------------------|
| PARAMETER                | PUBLISHED VALUE | CONDITION / NOTE |
| Plate voltage            | 45 V            | —                |
| Grid 1 return resistance | 5 megohm        | —                |
| Grid 2 voltage           | 45 V            | —                |
| Plate current            | 0.75 mA         | —                |
| Grid 2 current           | 0.2 mA          | —                |

| CHARACTERISTIC   |                 |                  |
|------------------|-----------------|------------------|
| PARAMETER        | PUBLISHED VALUE | CONDITION / NOTE |
| Plate resistance | 1500000 ohm     | —                |
| Transconductance | 750 uS          | —                |



SOURCE DATA APPENDIX

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 | 67.5 V          | ClassA           |
| Plate current | 0.75 mA         | ClassA           |

| CAPACITANCE   |                 |                  |
|---------------|-----------------|------------------|
| PARAMETER     | PUBLISHED VALUE | CONDITION / NOTE |
| Grid to plate | 0.01 pF         | —                |



SOURCE DATA APPENDIX

# 1966 Tung Sol Electronic Tubes 1 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 1 OF 4

Section 1 · Pentode

| OTHER            |                 |                  |
|------------------|-----------------|------------------|
| PARAMETER        | PUBLISHED VALUE | CONDITION / NOTE |
| Filament voltage | 1.25 V          | —                |
| Filament current | 40 mA           | —                |
| Plate voltage    | 90 V            | ClassA           |
| Screen voltage   | 90 V            | ClassA           |

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