

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

1A4

Voltage - Pentode electronic tube

1 SECTION
CONSTRUCTION
PENTODE

Directly heated pentode for radio-frequency and intermediate-frequency amplification in battery receivers. RCA designed it as a low-power signal tube for portable battery-operated radio equipment rather than an output-stage device.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	2 V / 60 mA	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.00075 S
AMPLIFICATION FACTOR	750
MAXIMUM PLATE VOLTAGE	180 V
MAXIMUM CATHODE CURRENT	3.1 mA
Published maximum ratings and electrical characteristics promoted from the approved source.	

1A4 — Super-Control R-F Amplifier Pentode

Overview

The **1A4** is a filament-type, super-control radio-frequency (R-F) amplifier pentode designed primarily for use in battery-operated receivers. It is intended for radio-frequency or intermediate-frequency (I-F)

amplification. The 1A4 is similar in application to the type [34](#), but is constructed in a smaller bulb and requires less B-battery power because of its less remote cut-off characteristic.

Mechanical Construction and Pinout

The 1A4 is housed in an ST-12 glass bulb and features a small metal top cap and a small 4-pin base. Its physical dimensions include a maximum diameter of 1-9/16", an overall height ranging from 4-9/32" to 4-17/32", and a seated height of 3-3/4" to 4-1/32".

The electrical connections are distributed between the 4-pin base and the top cap. The pinout configuration, viewed from the bottom of the base, is as follows:

Pin / Connection	Electrode
Pin 1	Filament + (F+)
Pin 2	Plate (P)
Pin 3	Screen Grid (Grid No. 2 / <u>G2</u>)
Pin 4	Filament - / Suppressor Grid (F-, Grid No. 3 / G3)
Top Cap	Control Grid (Grid No. 1 / G1)

The suppressor grid (Grid No. 3) is internally tied to the negative side of the filament at Pin 4.

Filament Ratings

The 1A4 features a directly heated filament designed for low-power battery operation. The filament ratings are:

- **Filament Voltage (D.C.):** 2.0 V
- **Filament Current:** 0.060 A

This low filament current consumption of 60 mA makes the tube highly efficient for portable or battery-powered receiver designs.

Electrical Characteristics and Operating Conditions

The 1A4 can be operated under different plate and screen voltage conditions. The published typical and maximum operating points illustrate its performance as a high-gain, high-resistance pentode:

Parameter	Typical Operating Point	Maximum Operating Point
Plate Voltage	90 V	180 V max.
Screen Voltage (Grid No. 2)	67.5 V max.	67.5 V max.
Grid Voltage (Grid No. 1)	-3 V min.	-3 V min.

Parameter	Typical Operating Point	Maximum Operating Point
Plate Current	2.2 mA	2.3 mA
Screen Current	0.9 mA	0.8 mA
Plate Resistance (Approx.)	0.6 Megohm	1.0 Megohm
Amplification Factor	425	750
Transconductance	720 Micromhos	750 Micromhos
Transconductance (at -15 V bias)	15 Micromhos	15 Micromhos

At a control grid bias of -15 V, the transconductance drops to 15 micromhos under both operating conditions, demonstrating the super-control (remote cut-off) action of the control grid, which allows for effective automatic volume control (AVC) or manual gain control without severe distortion.

Interelectrode Capacitances

To ensure stable high-frequency operation and minimize feedback, the 1A4 is designed with low grid-to-plate capacitance. The capacitance values are:

- **Grid-to-Plate Capacitance (with shield-can):** 0.007 pF max.
- **Input Capacitance:** 5 pF
- **Output Capacitance:** 11 pF

The extremely low grid-to-plate capacitance of 0.007 pF (when used with an external shield-can) is critical for preventing self-oscillation in high-gain R-F and I-F amplifier stages.

Average Plate Characteristics and Curve Interpretation

The average plate characteristics of the 1A4, measured with a filament voltage of 2.0 V D.C. and a screen grid voltage of 67.5 V, reveal typical pentode behavior:

- **Pentode Knee:** Below approximately 50 V of plate voltage, the plate current curves exhibit a typical pentode knee, where current falls off rapidly as plate voltage decreases.
- **High Plate Resistance:** Above 80 V of plate voltage, the curves become highly flat. This horizontal profile indicates a very high dynamic plate resistance, which is typical of RF pentodes and is documented as reaching up to 1.0 megohm.
- **Control Grid Control:** The curves are plotted for control-grid voltages from 0 V down to -7 V. At a control-grid voltage of 0 V, the plate current levels off at approximately 4.5 mA. When the bias is increased to -3 V, the plate current levels off at approximately 2.2 mA, demonstrating the direct control of grid bias over plate current.

Application and Installation

The 1A4 is designed for R-F and I-F amplifier service in battery-operated receivers. For specific installation and application details, reference is made to the type [34](#), which shares similar application guidelines. However, the 1A4 offers physical advantages over the type [34](#), including its smaller ST-12 bulb and reduced B-battery power requirements due to its less remote cut-off characteristic.

Technical Summary

The **1A4** is a filament-type super-control R-F amplifier pentode housed in an ST-12 bulb with a small 4-pin base and a top cap. Operating with a 2.0 V, 0.060 A D.C. filament, it is optimized for battery-operated receivers. It features a high plate resistance of 0.6 to 1.0 Megohm, an amplification factor of 425 to 750, and a transconductance of 720 to 750 Micromhos under typical and maximum operating conditions. Its super-control characteristic is shown by the reduction of transconductance to 15 Micromhos at a grid bias of -15 V. With a grid-to-plate capacitance of only 0.007 pF (with shield-can), the 1A4 provides stable, high-gain amplification in R-F and I-F stages while conserving battery power.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1940 RCA

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

1940 RCA

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterVoltageNominal	2 V	Nominal
HeaterCurrentNominal	60 mA	Nominal
Maximum Plate Voltage	180 V	—
Maximum Cathode Current	3.1 mA	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	750 μ S	Typical
Amplification Factor	750	Typical
Plate Resistance	1000000 ohm	Typical

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