

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

1A4T

1 SECTION
CONSTRUCTION
PENTODE

Voltage - Pentode Remote Cutoff (single) electronic tube

Directly heated remote-cutoff RF pentode using a 2.0 V, 60 mA filament. Designed for Class A radio-frequency amplification, its variable-mu characteristic permits controlled gain in battery-operated receiver stages.

GENERAL CHARACTERISTICS

BASE DESIGNATION	4K	BASE PINS	4
NOMINAL HEATER	2 V / 60 mA	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

4K - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – F	–	F – Filament	CONNECTED
PIN2 – P	A	P – Plate (Anode)	CONNECTED
PIN3 – G2	A	G2 – Screen Grid	CONNECTED
PIN4 – F	–	F – Filament	CONNECTED
CAP1 – G1	A	G1 – Control Grid	CONNECTED

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	1000000 Ω
TRANSCONDUCTANCE	0.00075 S
AMPLIFICATION FACTOR	720
MAXIMUM PLATE VOLTAGE	180 V
MAXIMUM SCREEN VOLTAGE	67.5 V
<i>Remote-cutoff RF pentode.</i>	

1A4T — Remote-Cutoff Amplifier

A battery-operated, remote-cutoff amplifier tube designed for high-frequency amplifier service in battery-powered radio receivers.

Overview

The **1A4T** (also designated as **1A4-T**) is a battery-operated, remote-cutoff amplifier tube designed primarily for high-frequency amplifier service in battery-powered radio receivers. Characterized by its low filament power requirements and remote-cutoff transfer characteristic, the tube is variously classified as a tetrode or a remote-cutoff RF pentode. It features a glass bulb envelope, a small four-prong base, and a top cap connection for the control grid.

Construction, Filament, and Physical Dimensions

The 1A4T is constructed with a directly heated filament designed for low-current DC operation.

Filament Characteristics

The filament is optimized for battery-operated equipment, requiring a low current to conserve battery life:

- **Filament Voltage:** 2.0 V DC
- **Filament Current:** 0.060 A (60 mA)
- **Filament Power (Calculated):** 2.0 V * 0.060 A = 0.12 W

Physical Dimensions and Envelope

The tube utilizes a glass bulb, specifically an **ST 12-D** envelope (with an outline drawing designation of **12-6**). The physical dimensions are constrained as follows:

- **Maximum Outer Diameter:** 1-3/16 inches
- **Maximum Seated Height:** 3-29/32 inches
- **Maximum Overall Height:** 4-17/32 inches

Base and Pinout

The 1A4T features a small **4-prong base** (base connection **4K**). The control grid is brought out to a top cap on the glass envelope to minimize input-to-output capacitance, which is critical for stable high-frequency amplification. The bottom-view pin connections are:

Pin / Cap	Connection	Symbol
Pin 1	Filament (Positive)	F+
Pin 2	Plate	P
Pin 3	Screen Grid	<u>G2</u>
Pin 4	Filament (Negative)	F-
Top Cap	Control Grid	G1

Electrical Characteristics and Typical Class A Operation

The 1A4T operates as a Class A amplifier. At its typical operating point, it provides a high amplification factor and high plate resistance, which are characteristic of screen-grid amplifier tubes.

Typical Operating Conditions

Under typical Class A conditions, the tube exhibits the following electrical parameters:

Parameter	Value
Plate Voltage	180 V
Screen Voltage (Grid 2)	67.5 V
Control Grid Bias (Grid 1)	-3 V
Plate Current	2.3 mA
Screen Current	0.7 to 0.8 mA
Plate Resistance	0.96 MΩ to 1.0 MΩ
Transconductance	750 μmhos
Amplification Factor	720
Transconductance at -15 V Bias	15 μmhos

The remote-cutoff characteristic is demonstrated by the significant reduction in transconductance from 750 μmhos at a -3 V bias down to 15 μmhos when the negative grid bias is increased to -15 V. This allows

the tube's gain to be controlled over a wide range by varying the grid bias, making it highly suitable for automatic volume control (AVC) circuits.

Interelectrode Capacitances

The interelectrode capacitances of the 1A4T vary depending on whether an external tube shield is employed. The top-cap control grid design helps maintain extremely low grid-to-plate capacitance, reducing the risk of unwanted feedback and oscillation in high-frequency circuits.

Capacitance	With Tube Shield	Without External Shield
Grid to Plate (max)	0.012 μF	0.007 μF
Input	4.6 μF	5.0 μF
Output	11 μF	11.0 μF

Maximum Ratings

To ensure reliable operation and prevent premature failure, the operating voltages of the 1A4T must be kept within the following maximum limits:

- **Maximum Plate Voltage:** 180 V
- **Maximum Screen Voltage:** 67.5 V

Characteristic Curves and Behavior

The electrical behavior of the 1A4T is illustrated by its characteristic curves under specific operating conditions.

Average Plate Characteristics

When plotted at a filament voltage of 2.0 V DC and a screen voltage of 67.5 V, with the control grid bias varied from 0 V to -7 V, the plate current curves reveal a distinct region below approximately 60 V of plate voltage. In this low-voltage region, the values are marked as unstable. This instability is a classic characteristic of tetrode-like structures, where secondary emission from the plate to the screen grid causes negative resistance effects when the plate voltage is lower than the screen voltage.

Average Transfer Characteristics

At a plate voltage of 180 V and a screen voltage of 67.5 V, the transfer curves (plotting plate current and transconductance against control grid bias from 0 V to -15 V) show that transconductance peaks near 1000 μmhos at 0 V bias. As the negative bias increases, the transconductance and plate current decrease smoothly, reaching a low value of 15 μmhos at -15 V. This smooth, gradual cutoff behavior confirms the remote-cutoff design, which prevents cross-modulation and distortion when handling strong radio signals.

Related Designations and Equivalents

The 1A4T is closely related to several other vacuum tube types:

- **Type 1D5GT:** The electrical characteristics and maximum ratings of the 1A4T are identical to those of the 1D5GT.
- **Type 1A4P and 1D5GP:** For the pentode variant designated as 1A4P, the corresponding equivalent type is the 1D5GP.

These relationships indicate identical electrical performance, though physical envelopes and base styles may differ between the designations.

Technical Summary

The **1A4T** is a battery-operated, remote-cutoff amplifier tube featuring a directly heated 2.0 V, 0.06 A filament. Housed in an ST 12-D glass envelope with a small 4-prong base and a top cap control grid, it is designed for high-frequency amplification in battery-powered receivers. Operating at a maximum plate voltage of 180 V and a screen voltage of 67.5 V, it provides a transconductance of 750 μmhos , a plate resistance of approximately 1 M Ω , and an amplification factor of 720 under typical Class A conditions. Its remote-cutoff characteristic allows for effective gain control, while its low grid-to-plate capacitance ensures stable operation in RF and IF amplifier stages.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1937 Raytheon Radio Receiving Tubes

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

1937 RAYTHEON RADIO RECEIVING TUBES

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	180 V	ClassA
Screen voltage	67.5 V	ClassA
Grid bias	-3 V	ClassA
Plate current	2.3 mA	ClassA
Screen current	0.7 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance at -15 V bias	15 uS	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	—0.012 pF	WithTubeShield; Maximum
Input capacitance	4.6 pF	—
Output capacitance	11 pF	—

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	5 pF	—
Output capacitance	11 pF	—
Grid-to-plate capacitance	0.007 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	180 V	ClassA
Screen voltage	67.5 V	ClassA
Grid voltage	-3 V	ClassA
Plate current	2.3 mA	ClassA
Screen current	0.8 mA	ClassA

TUBE TINKER

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