

ELECTRONIC TUBE REFERENCE

01A

Voltage - Triode (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

General-purpose detector and amplifier triode for early radio receivers, providing directly heated low-power signal detection and amplification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	4D	BASE PINS	4
NOMINAL HEATER	5 V / 250 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	10000 Ω
TRANSCONDUCTANCE	0.0007999999999999999 S
AMPLIFICATION FACTOR	8
MAXIMUM PLATE VOLTAGE	135 V
Published ratings and characteristics promoted from the approved datasheet.	

01A — Low-Mu Triode Detector and Amplifier Vacuum Tube

The **01A** (also designated as **01-A**, **CX-301-A**, or **'01-A**) is a classic three-electrode, filament-type triode vacuum tube designed primarily for service as a detector or amplifier in storage battery-operated radio receivers. It is frequently employed as a replacement tube in older receivers, offering reliable performance in both radio-frequency (RF) and audio-frequency (AF) stages.

Physical Construction, Base, and Pinout

The 01A is constructed with a glass envelope, utilizing either an **S-14** (straight-sloped sided) or **ST14** bulb. It features a **medium 4-pin base** (UX4 style, base connection 4D) that fits standard four-contact sockets.

Physical Dimensions

- **Maximum Overall Length:** 4-11/16 inches (4.688 inches)
- **Maximum Diameter:** 1-13/16 inches (1.813 inches)
- **Maximum Height to Shoulder:** 4-1/16 inches

Installation and Mounting

The recommended mounting position for the 01A is strictly **vertical**. When the tube is utilized in a detector stage, employing a cushioning socket is highly desirable to minimize microphonic disturbances and mechanical vibration.

Pin Connections

The bottom view of the socket reveals a four-pin layout where the two larger pins at the bottom correspond to the filament. The pinout configuration is as follows:

Pin Number	Electrode Connection
Pin 1	Filament (F)
Pin 2	Plate (P)
Pin 3	Grid (G / G1)
Pin 4	Filament (F)

Filament Ratings and Power Supply

The 01A features a directly heated filament designed for direct-current (DC) operation.

- **Filament Voltage (DC):** 5.0 V
- **Filament Current:** 0.25 A

The tube is specifically engineered to operate from a **6-volt storage battery** source. To prevent damage and ensure the correct operating voltage, a fixed or variable series resistor must be placed in the filament circuit to reduce the voltage to the nominal 5.0 V across the filament terminals at the socket.

Electrical Characteristics and Class A Operating Points

The 01A operates with a maximum plate voltage rating of **135 V**. Under Class A amplifier service, the tube exhibits the following typical electrical characteristics at its primary operating points:

Parameter	Operating Point A	Operating Point B
Plate Voltage	90 V	135 V (Maximum)
Grid Bias (G1)	-4.5 V	-9.0 V
Plate Current	2.5 mA	3.0 mA
Plate Resistance	11,000 Ω	10,000 Ω
Transconductance (Mutual Conductance)	725 μmhos	800 μmhos
Amplification Factor (μ)	8.0	8.0

Direct Interelectrode Capacitances

The internal capacitances of the 01A electrodes are stable and measured as follows:

- **Grid to Plate (Grille to plaque):** 8.1 μmhos (MMFD)
- **Input (Grid to Filament):** 3.1 μmhos (MMFD)
- **Output (Plate to Filament):** 2.2 μmhos (MMFD)

Circuit-Specific Applications

The 01A is highly versatile, with specific operating parameters defined for both detection and amplification.

Detector Service

The tube can be configured as a detector using one of two primary methods:

1. **Grid Leak and Condenser Method:** This is the recommended configuration for standard detection.
 - **Plate Voltage:** 45 V (the plate voltage is generally not critical in this mode)
 - **Grid Leak Resistance:** 0.25 to 5 M Ω (typically 1 to 5 M Ω)
 - **Grid Condenser:** 250 μmhos (0.00025 μmhos)
 - **Grid Return:** Connected directly to the positive filament terminal
2. **Grid Bias Method:**
 - **Plate Voltage:** Up to 135 V maximum
 - **Grid Bias:** Approximately -7.5 V (at 90 V plate) to -13.5 V (at 135 V plate)
 - **Plate Current:** Adjusted to 0.2 mA in the absence of an incoming signal

Amplifier Service

The 01A performs reliably in high-frequency and low-frequency amplification stages:

- **Radio-Frequency (RF) Amplifier:** When used in RF stages, operating the plate at voltages exceeding 90 V provides little additional gain. Volume control in these stages is typically achieved by varying either the grid bias or the plate voltage applied to the RF tubes.
- **Audio-Frequency (AF) Amplifier:** The 01A is well adapted for interstage AF voltage amplification. However, because of its low power handling capabilities, it is recommended to use a dedicated power output tube for the final audio stage rather than an 01A.

Dynamic Behavior and Curve Interpretation

Analyzing the dynamic characteristics of the 01A reveals highly predictable triode behavior across its operating range.

Plate and Transfer Characteristics

The average plate characteristics (I_b vs. E_b) plotted for grid voltages (E_c) from 0 to -18.0 V in 1.5 V steps show parallel, evenly spaced curves. This indicates a high degree of linearity, particularly at plate voltages starting above 80 V for lower bias values. The transfer characteristics (I_b vs. E_c) plotted across plate voltages from 45 V to 157.5 V over a grid range of -15 V to +3 V further demonstrate this consistent behavior.

Parameter Variations vs. Plate Current

When examining the dynamic parameters as a function of plate current (I_b) from 1 mA to 12 mA, several key trends emerge:

- **Amplification Factor (μ_{3bc}):** Remains remarkably stable and flat, staying between 7.5 and 8.5 (typically around 8.0 to 8.2) across the entire plate current range.
- **Mutual Conductance (g_m):** Rises continuously and non-linearly from approximately 300 μ S at 1 mA to about 1,100 μ S at 12 mA.
- **Plate Resistance (r_p):** Decreases sharply from a high of 18,000 Ω at 1 mA down to approximately 6,000 Ω at 12 mA.

Technical Summary

The **01A** is a classic low- μ triode vacuum tube designed for battery-operated receivers. It features a 5.0 V, 0.25 A filament, a medium 4-pin base, and is housed in an S-14 or ST14 glass envelope. Operating with a maximum plate voltage of 135 V, it provides an amplification factor of 8, a plate resistance of 10,000 to 11,000 Ω , and a transconductance of 725 to 800 μ S under typical Class A conditions. The 01A is highly suited for interstage audio amplification, radio-frequency amplification, and grid-leak or biased detector service, provided it is mounted vertically and protected against microphonic disturbances in sensitive stages.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1932 Cunningham Radio Tubes

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

1932 CUNNINGHAM RADIO TUBES

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-plate capacitance	8.1 pF	Published direct interelectrode capacitance
Grid-filament capacitance	3.1 pF	Published direct interelectrode capacitance
Plate-filament capacitance	2.2 pF	Published direct interelectrode capacitance

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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	90 V	ClassA
Grid bias	-4.5 V	ClassA
Plate current	2.5 mA	ClassA; PlateVoltage=90V
Plate voltage	135 V	ClassA
Grid bias	-9 V	ClassA; PlateVoltage=135V
Plate current	3 mA	ClassA; PlateVoltage=135V
Plate voltage	45 V	Detector; GridLeak
Grid leak resistance	0.25–5 MOhm	Detector; GridLeak
Grid condenser	250 pF	Detector; GridLeak

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	11000 ohm	ClassA; PlateVoltage=90V
Transconductance	725 uS	ClassA; PlateVoltage=90V
Plate resistance	10000 ohm	ClassA; PlateVoltage=135V
Transconductance	800 uS	ClassA; PlateVoltage=135V

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	8.1 pF	—
Input capacitance	3.1 pF	—
Output capacitance	2.2 pF	—


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

193X Cunningham

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

193X CUNNINGHAM

Section 1 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater/filament voltage	5 V	Published nominal
Heater/filament current	250 mA	Published nominal
Transconductance	800 uS	Published characteristic
Amplification factor	8	Published characteristic
Plate resistance	10000 Ohm	Published characteristic


SOURCE DATA APPENDIX

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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	135 V	Published handbook rating
Plate voltage	135 V	ClassA
Control-grid bias	0 V	ClassA
Plate current	3 mA	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	10000 ohm	Published handbook characteristic
Transconductance	800 μS	Published handbook characteristic
Amplification factor	8	Published handbook characteristic
Heater/filament voltage	5 V	Published heater/filament rating
Heater/filament current	250 mA	Published heater/filament rating