

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

12A

1 SECTION
CONSTRUCTION
TRIODE

Voltage - Triode (single) electronic tube

Directly heated triode for detector and amplifier service in early receiving equipment.

GENERAL CHARACTERISTICS

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

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	4700 Ω
TRANSCONDUCTANCE	0.0018 S
AMPLIFICATION FACTOR	8.5
MAXIMUM PLATE VOLTAGE	180 V
Published ratings/characteristics promoted where semantically applicable.	

12A — Detector-Amplifier Triode Vacuum Tube

A directly heated triode designed for service as a detector or amplifier in storage battery operated receivers, offering a lower internal plate resistance than the classic 01A.

Overview

The **12A** is a classic triode vacuum tube designed for service as a detector or amplifier in storage battery operated receivers. It is classified as a detector-amplifier triode and is housed in a glass envelope with a four-pin base. The tube is engineered to provide a lower internal plate resistance than the older 01A

triode, making it a valuable option for low-frequency (audio) and high-frequency (radio-frequency) amplification as well as detection. In later years of vacuum tube technology, the 12A was primarily utilized as a replacement type for servicing legacy battery-operated equipment.

Physical Construction and Pinout

The 12A features a directly heated filament and is constructed using either an ST-14 dome-style glass bulb or an S-14 straight-sloped sided glass bulb. The tube is fitted with a medium four-pin base, designated as the 4-D or M-4 base.

For proper operation, the tube must be mounted in a **vertical position**. The physical dimensions of the device are constrained by the following maximum limits:

- **Maximum Overall Height:** 4 11/16 inches (4.688 inches)
- **Maximum Seated Height:** 4 1/16 inches
- **Maximum Bulb Diameter:** 1 13/16 inches (1.813 inches)

The base connections, viewed from the bottom of the tube socket, follow a standard four-pin layout (4D arrangement):

- **Pin 1:** Filament
- **Pin 2:** Plate
- **Pin 3:** Grid
- **Pin 4:** Filament

According to standard pin identification conventions for this base type, when the base is pointed toward the observer with the two larger filament pins positioned at the top, a vertical line separates them. The filament pin to the right of this line is designated as Pin 1. The remaining pins are numbered consecutively from Pin 2 through Pin 4 in a clockwise direction.

Electrical Ratings and Class A Operating Points

The 12A is designed to operate with a direct current (DC) filament supply, though alternating current (AC) may also be used. The primary filament ratings and maximum electrical limits are:

- **Filament Voltage:** 5.0 V (DC or AC)
- **Filament Current:** 0.25 A
- **Maximum Plate Voltage:** 180 V

Under Class A amplifier service, the 12A can be operated at several typical plate potentials. The electrical characteristics and operating parameters vary with the applied plate voltage as follows:

Parameter	90 V Operating Point	135 V Operating Point	180 V Operating Point
Plate Voltage	90 V	135 V	180 V
Grid Bias (Negative)	-4.5 V	-9.0 V	-13.5 V

Parameter	90 V Operating Point	135 V Operating Point	180 V Operating Point
Plate Current	5.0 to 5.2 mA	6.2 mA	7.6 to 7.7 mA
Plate Resistance	5,400 ohms	5,100 ohms	4,700 ohms
Transconductance	1,575 umhos	1,650 umhos	1,800 umhos
Amplification Factor (mu)	8.5	8.5	8.5
Load Resistance	5,000 to 5,500 ohms	9,000 ohms	10,200 to 10,650 ohms
Power Output (5% 2nd Harmonic)	0.035 W (35 mW)	0.13 W (130 mW)	0.285 W (285 mW)

When designing circuits using the 12A as an amplifier, if a grid resistor is employed in the grid circuit, its resistance value must not exceed a maximum limit of **1 megohm**.

Detector Applications

The 12A is highly versatile and can be configured for two distinct types of detector service: biased detection (plate detection) and grid leak detection.

Biased Type Detector

In biased detector service, the grid bias is adjusted to restrict plate current under zero-signal conditions, allowing rectification to occur. The typical operating parameters for this configuration are:

- **Plate Voltage:** 135 V or 180 V
- **Grid Bias (Approximate):** -15 V (at 135 V plate) or -21 V (at 180 V plate)
- **Plate Current:** Adjusted to 0.2 mA with no input signal.

Grid Leak Type Detector

In grid leak detector service, the tube operates at a lower plate voltage and utilizes a grid capacitor and resistor combination to achieve rectification. The standard operating conditions are:

- **Plate Voltage:** 45 V
- **Grid Return:** Connected to the positive terminal of the filament.
- **Grid Leak Resistance:** 0.25 to 5 megohms.
- **Grid Condenser (Capacitor):** 0.00025 uF (250 pF).

Interelectrode Capacitances

The direct interelectrode capacitances of the 12A are measured without an external shield. Depending on the specific manufacturing tolerances and measurement standards, the capacitance values fall within the

following ranges:

- **Grid-to-Plate Capacitance:** 7.5 to 8.5 pF (with specific documented values of 7.5 pF, 8.1 pF, and 8.5 pF).
- **Input Capacitance:** 4.0 pF.
- **Output Capacitance:** 2.0 to 3.0 pF (with specific documented values of 2.0 pF and 3.0 pF).

These capacitances are critical parameters when utilizing the tube in high-frequency (R.F.) amplifier stages, as they influence the input impedance and potential feedback paths within the circuit.

Comparison with the 01A Triode

The 12A was specifically developed to address the limitations of the widely used 01A triode in storage battery operated receivers. The primary design objective of the 12A was to offer a significantly lower internal plate resistance than that of the 01A.

While both tubes operate with a 5.0 V filament supply, the lower plate resistance of the 12A (ranging from 4,700 to 5,400 ohms depending on the operating point) allows for improved impedance matching and power transfer, particularly in low-frequency (audio) transformer-coupled amplifier stages. This lower internal resistance makes the 12A a superior choice for applications where the higher plate resistance of the 01A would limit performance.

Technical Summary

The **12A** is a directly heated, medium-mu detector-amplifier triode designed for use in storage battery operated radio receivers. Operating with a **5.0 V, 0.25 A** filament supply and a maximum plate voltage of **180 V**, the tube provides an amplification factor of **8.5** and a transconductance of up to **1,800 umhos** under typical Class A conditions. Its physical construction features an ST-14 or S-14 glass bulb, a medium 4-pin base, and requires vertical mounting. With its low internal plate resistance of **4,700 to 5,400 ohms**, the 12A serves as an efficient alternative to the 01A triode, delivering reliable performance in Class A amplifier, biased detector, and grid leak detector circuits.

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; PlateVoltage=90V
Plate current	5 mA	ClassA; PlateVoltage=90V
Plate voltage	135 V	ClassA
Grid bias	-9 V	ClassA; PlateVoltage=135V
Plate current	6.2 mA	ClassA; PlateVoltage=135V
Plate voltage	180 V	ClassA
Grid bias	-13.5 V	ClassA; PlateVoltage=180V
Plate current	7.7 mA	ClassA; PlateVoltage=180V

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	5400 ohm	ClassA; PlateVoltage=90V
Transconductance	1575 uS	ClassA; PlateVoltage=90V
Plate resistance	5100 ohm	ClassA; PlateVoltage=135V
Transconductance	1650 uS	ClassA; PlateVoltage=135V
Plate resistance	4700 ohm	ClassA; PlateVoltage=180V
Transconductance	1800 uS	ClassA; PlateVoltage=180V

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	7.5 pF	—
Input capacitance	4 pF	—
Output capacitance	3 pF	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance	5100 ohm	PlateVoltage=135V
Transconductance	1650 uS	PlateVoltage=135V
Amplification Factor	8.5	PlateVoltage=135V



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 · Triode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input capacitance	4 pF	—
Output capacitance	2 pF	—
Grid-to-plate capacitance	8.5 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	180 V	ClassA
Grid voltage	-13.5 V	ClassA

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate current	7.7 mA	ClassA
Load resistance	10650 ohm	ClassA
Power output	0.285 W	ClassA

TUBE TINKER

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