



ELECTRONIC TUBE REFERENCE

101L

Voltage - Triode (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

Filamentary triode for audio-frequency amplification or modulation, using a low-current directly heated cathode for professional communications circuits.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	4
NOMINAL HEATER	4.15 V / 250 mA	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
PLATE RESISTANCE	6000 Ω
TRANSCONDUCTANCE	0.00108 S
AMPLIFICATION FACTOR	6.5
MAXIMUM PLATE VOLTAGE	180 V
MAXIMUM PLATE DISSIPATION	2 W
Coated-filament audio-frequency amplifier triode; design-center maximum plate dissipation 2.0 W.	

101L — Filamentary Triode Vacuum Tube

A low- μ filamentary triode designed for use as an audio-frequency amplifier or modulator in general-purpose applications.

Overview

The **101L** is a classic filamentary-type triode developed by Bell Telephone Laboratories and manufactured by Western Electric. It is engineered specifically for audio-frequency amplification and modulator service. Featuring a directly heated, coated filament cathode, the 101L operates with a low amplification factor of 6.5 and is characterized by its robust construction, stable electrical parameters, and moderate power requirements.

The tube is housed in an ST 14 glass bulb with a medium 4-pin bayonet base. It is designed to operate under conservative maximum ratings, with a design-center limit of 180 volts on the plate and a maximum plate dissipation of 2.0 watts.

Construction, Filament, and Mechanical Specifications

The 101L utilizes a directly heated, coated filament cathode. The filament is designed for direct-current (D.C.) operation, drawing a nominal current of 250 milliamperes.

Filament Stabilization

The filament of the 101L exhibits a unique operational characteristic during its early life: its electrical resistance increases slightly during the first year of operating service. Consequently, the nominal filament voltage is specified at **4.15 volts** after this resistance has stabilized.

Mechanical Dimensions and Mounting

The physical structure of the 101L is defined by the following mechanical parameters:

Parameter	Specification
Bulb Type	ST 14 glass
Base Type	A4-36 Medium 4-pin with bayonet pin
Maximum Overall Length	4-1/2 inches
Maximum Bulb Diameter	1-13/16 inches
Seated Height to Bayonet Pin	0.972 inches (maximum)
Pin Diameter	0.125 inches ± 0.003 inches
Pin Stud with Solder Limit	0.129 inches (maximum)

The tube is designed to be mounted preferably in a **vertical** position. If horizontal mounting is required, the tube must be oriented such that pins #1 and #2 lie in the same vertical plane to prevent filament sag or shorting.

Pin Connections

The A4-36 base provides the following connections, viewed from the bottom of the tube:

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

The plane of the filament is aligned with the axis of pins 3 and 4.

Electrical Characteristics and Interelectrode Capacitances

The 101L is characterized by low interelectrode capacitances, measured without an external shield:

- **Grid to Plate:** 6.0 uuf
- **Input:** 3.9 uuf
- **Output:** 2.8 uuf

These low capacitances support stable operation in audio-frequency circuits without requiring extensive shielding or neutralization.

Maximum Ratings

The maximum ratings for the 101L are established under the Design-Center system. Operating the tube beyond these limits may compromise its performance and longevity.

Rating	Design-Center Value
Maximum Plate Voltage	180 volts
Maximum Plate Dissipation	2.0 watts
Maximum Plate Current	15 milliamperes

Typical Operating Conditions and Class A1 Amplifier Service

The 101L is typically operated as a Class A1 audio-frequency amplifier. Two standard operating points are defined for this service, utilizing a D.C. filament current of 250 milliamperes:

Parameter	Operating Point I	Operating Point II
Plate Voltage	130 V	160 V
Grid Voltage	-8 V	-10 V

Parameter	Operating Point I	Operating Point II
Peak A-F Grid Voltage	8 V	10 V
Plate Current	6.8 mA	10.2 mA
Transconductance	1080 micromhos	1240 micromhos
Amplification Factor	6.5	6.5
Plate Resistance	6000 ohms	5200 ohms
Load Resistance	6000 ohms	5200 ohms
Maximum Signal Power Output	60 mW	100 mW
Total Harmonic Distortion	< 3.4%	< 3.2%

Operating Point Analysis

At a plate voltage of 130 V and a grid bias of -8 V, the tube draws 6.8 mA of plate current. Under these conditions, the plate resistance is 6000 ohms, matching the recommended load resistance of 6000 ohms. This configuration delivers a maximum signal power output of 60 milliwatts with less than 3.4% total harmonic distortion.

Increasing the plate voltage to 160 V and adjusting the grid bias to -10 V increases the plate current to 10.2 mA. This shifts the transconductance upward to 1240 micromhos and lowers the plate resistance to 5200 ohms. When matched with a 5200-ohm load resistance, the stage delivers an increased maximum signal power output of 100 milliwatts, while the total harmonic distortion is reduced to less than 3.2%.

Characteristic Curves and Behavior

The electrical behavior of the 101L across its operating range is illustrated by several key relationships:

- **Plate Current vs. Plate Voltage:** The plate family curves demonstrate that at a constant filament current of 250 mA D.C., the plate current increases smoothly with plate voltage. For a grid bias of 0 V, the plate current rises rapidly, reaching the 15 mA maximum rating at approximately 120 V. As negative grid bias is increased (up to -28 V), the curves shift to the right, requiring higher plate voltages to initiate conduction.
- **Plate Current vs. Grid Voltage (Transfer Characteristics):** The transfer curves show a highly linear region, particularly at higher plate voltages such as 160 V and 190 V, which minimizes odd-order harmonic distortion during large signal swings.
- **Amplification Factor vs. Grid Voltage:** The amplification factor remains remarkably flat and stable, holding steady at approximately 6.4 to 6.5 across a wide range of grid bias voltages (from 0 V down to -28 V) and plate voltages (from 70 V to 190 V). This flat characteristic ensures consistent gain performance.
- **Plate Resistance and Transconductance vs. Grid Voltage:** As the grid bias becomes more negative, the plate resistance increases significantly, while the transconductance decreases. For

example, at a plate voltage of 130 V, making the grid bias more negative than -12 V causes a sharp upward trend in plate resistance and a corresponding drop in transconductance, highlighting the importance of selecting the recommended operating bias points (-8 V to -10 V) for optimal gain and power transfer.

Technical Summary

The **101L** is a specialized, low-mu filamentary triode designed by Bell Telephone Laboratories for Western Electric audio-frequency amplifier and modulator applications. Operating with a stabilized filament voltage of 4.15 V at 250 mA, it provides an amplification factor of 6.5. With a maximum plate voltage rating of 180 V and a plate dissipation limit of 2.0 W, the 101L delivers up to 100 milliwatts of low-distortion audio output in Class A1 service. Its robust mechanical design, featuring an ST 14 bulb and a medium 4-pin bayonet base, ensures reliable performance in standard vertical mounting configurations.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

2026 Western Electric 100s

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

2026 WESTERN ELECTRIC 100S

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament voltage	4.15 V	—
Filament current	250 mA	—
Maximum plate voltage	180 V	—
Maximum plate dissipation	2 W	—
Maximum plate current	15 mA	—
Plate voltage	130 V	ClassA; OperatingPoint1
Grid voltage	-8 V	ClassA; OperatingPoint1
Plate current	6.8 mA	ClassA; OperatingPoint1
Power output	60 mW	ClassA; OperatingPoint1
Total harmonic distortion	3.4 percent	ClassA; OperatingPoint1
Plate voltage	160 V	ClassA; OperatingPoint2
Grid voltage	-10 V	ClassA; OperatingPoint2
Plate current	10.2 mA	ClassA; OperatingPoint2
Power output	100 mW	ClassA; OperatingPoint2
Total harmonic distortion	3.2 percent	ClassA; OperatingPoint2

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	6 pF	Without external shield
Input capacitance	3.9 pF	Without external shield
Output capacitance	2.8 pF	Without external shield

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	6000 ohm	Representative published operating point
Transconductance	1080 uS	Representative published operating point
Amplification factor	6.5	Representative published operating point

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