

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

102D

1 SECTION
CONSTRUCTION
TRIODE

Voltage - Triode (single) electronic tube

Western Electric directly heated triode for professional electronic service. Available source material confirms its construction without establishing a narrower functional role confidently.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	4
NOMINAL HEATER	2.1 V / 1 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	63000 Ω
TRANSCONDUCTANCE	0.00047 S
AMPLIFICATION FACTOR	29.8
MAXIMUM PLATE VOLTAGE	190 V
Filamentary voltage-amplifier triode; long-life feature for continuous service.	

102D — Filamentary Voltage-Amplifier Triode

The **102D** is a three-element filamentary triode vacuum tube designed primarily for use as a voltage amplifier. Developed for applications requiring high reliability and long operating life, it is also suitable for use as a modulator, a detector, or in volume indicator circuits. A key feature of this tube is its exceptional longevity, offering an average operating life of approximately 70,000 hours when operated in the equipment for which it was designed, making it highly suited for continuous, uninterrupted service.

Filament and Electrical Ratings

The 102D features a directly heated filament designed to operate on a current basis. To ensure stable operation and maximize tube life, the filament should be operated as close to its rated current as practicable.

- **Filament Current:** 1.0 Ampere (D.C.)
- **Nominal Filament Voltage:** 2.1 Volts
- **Maximum Plate Voltage:** 190 Volts

While the electrical characteristics of the 102D are similar to those of the 102F, they are not identical. Specifically, the 102D operates at a filament current of 1.0 Ampere, which is twice the 0.5 Ampere filament current rating of the 102F. Consequently, direct substitution is not possible without modifying the filament supply circuit.

Physical Construction, Base, and Socket

The tube is constructed with a glass envelope and a specialized base designed to minimize electrical noise.

- **Physical Dimensions:** The tube has a maximum overall height of 4 1/2 inches and a maximum diameter of 2 3/8 inches.
- **Base Type:** It utilizes a medium, four-pin bayonet-type base. The contact prongs are equipped with special contact metal tips at their ends to prevent noise disturbances caused by poor electrical contact with socket springs.
- **Socket Compatibility:** The base is designed for use with four-contact, bayonet-slot sockets, preferably featuring contact-metal contacts. Compatible sockets include the Western Electric 100L (for front panel mounting) and the 100R (for rear panel mounting).
- **Mounting Position:** The tube can be mounted in either a vertical or horizontal position. When mounted horizontally, the plane of the filament must be oriented vertically.

Operating Conditions and Performance

The 102D operates with relatively low plate currents and a high amplification factor of approximately 30. The grid and plate voltages are measured from the negative end of the filament. Typical Class A operating points and performance characteristics under various plate voltages, grid biases, and load resistances (R) are as follows:

Plate Voltage (V)	Grid Bias (V)	Plate Current (mA)	Amplification Factor (μ)	Plate Resistance (r_p , Ω)	Trans conductance ($\mu\text{mh os}$)	Input Voltage (Peak V)	Load Resistance (R)	Output Voltage (Peak V)	2nd Harmonic (dB below fundamental)	3rd Harmonic (dB below fundamental)
130	-2.0	0.36	29.4	80,000	370	2.0	r_p	27	20	41
130	-2.0	0.36	29.4	80,000	370	2.0	$3r_p$	38	24	44
130	-2.0	0.36	29.4	80,000	370	2.0	$5r_p$	41	25	45
130	-1.5	0.58	29.8	63,000	470	1.5	r_p	20	26	47
130	-1.5	0.58	29.8	63,000	470	1.5	$3r_p$	30	31	50
130	-1.5	0.58	29.8	63,000	470	1.5	$5r_p$	34	33	55
130	-1.0	0.85	30.1	53,000	570	1.0	r_p	15	33	55
130	-1.0	0.85	30.1	53,000	570	1.0	$3r_p$	20	39	60
130	-1.0	0.85	30.1	53,000	570	1.0	$5r_p$	23	40	60
160	-3.0	0.34	29.2	81,000	360	3.0	r_p	40	18	36
160	-3.0	0.34	29.2	81,000	360	3.0	$3r_p$	57	21	40
160	-3.0	0.34	29.2	81,000	360	3.0	$5r_p$	62	22	40
160	-2.0	0.80	29.9	54,000	550	2.0	r_p	28	27	46
160	-2.0	0.80	29.9	54,000	550	2.0	$3r_p$	42	33	55

Plate Voltage (V)	Grid Bias (V)	Plate Current (mA)	Amplification Factor (μ)	Plate Resistance (r_p , Ω)	Trans conductance ($\mu\text{mh os}$)	Input Voltage (Peak V)	Load Resistance (R)	Output Voltage (Peak V)	2nd Harmonic (dB below fundamental)	3rd Harmonic (dB below fundamental)
160	-2.0	0.80	29.9	54,000	550	2.0	$5r_p$	45	34	55
160	-1.0	1.45	30.3	42,000	720	1.0	r_p	15	38	60
160	-1.0	1.45	30.3	42,000	720	1.0	$3r_p$	21	43	65
160	-1.0	1.45	30.3	42,000	720	1.0	$5r_p$	24	48	65
190*	-3.0	0.83	29.8	54,000	550	3.0	r_p	42	23	40
190*	-3.0	0.83	29.8	54,000	550	3.0	$3r_p$	63	28	48
190*	-3.0	0.83	29.8	54,000	550	3.0	$5r_p$	68	30	50
190*	-2.0	1.46	30.2	43,000	700	2.0	r_p	30	31	50
190*	-2.0	1.46	30.2	43,000	700	2.0	$3r_p$	43	38	60
190*	-2.0	1.46	30.2	43,000	700	2.0	$5r_p$	48	41	60

**Maximum Operating Conditions. Operating the tube at these maximum limits may result in a shorter operating life compared to less severe conditions.*

Performance Calculations for Reduced Input Voltages

The performance data listed above assumes a sinusoidal input voltage (E_{gm}) that is numerically equal to the grid bias. For a smaller peak input voltage (E_g), the approximate fundamental output voltage (E_p) and the second (F_2) and third (F_3) harmonic levels (in decibels below the fundamental) can be calculated using the following formulas:

- **Fundamental Output Voltage Calculation:** $E_p = E_{pm} \left(\frac{E_g}{E_{gm}} \right)$ Inputs: E_{pm} is the peak output voltage at full grid-bias input, E_g is the actual peak input voltage, and E_{gm} is the peak input voltage equal to the grid bias.
- **Second Harmonic Level Calculation:** $F_2 = F_{2m} + 20 \log_{10} \left(\frac{E_{gm}}{E_g} \right)$ Inputs: F_{2m} is the second harmonic level in decibels below the fundamental at full grid-bias input.
- **Third Harmonic Level Calculation:** $F_3 = F_{3m} + 40 \log_{10} \left(\frac{E_{gm}}{E_g} \right)$ Inputs: F_{3m} is the third harmonic level in decibels below the fundamental at full grid-bias input.

Microphonic Noise

Under typical operating conditions—specifically with a plate voltage of 130 Volts, a grid bias of -1.5 Volts, and a load resistance of 100,000 Ohms—the mean microphonic noise output level of the 102D is 30 decibels below 1 Volt. Individual tubes exhibit a range of microphonic noise levels extending from 18 to 38 decibels below 1 Volt, depending on the nature and intensity of the mechanical disturbance.

Interelectrode Capacitances

The direct interelectrode capacitances of the 102D vary depending on whether the tube is measured with or without a socket, and the type of socket configuration used. The table below details these capacitances (measured in micromicrofarads, $\mu\mu\text{F}$):

Capacitance Parameter	Column A (Based Tube Without Socket)	Column B (In 100L Socket on Metal Plate)	Column C (In 100R Socket on Metal Plate)
Grid to Plate	5.6 $\mu\mu\text{F}$	5.1 $\mu\mu\text{F}$	5.1 $\mu\mu\text{F}$
Grid to Filament	3.8 $\mu\mu\text{F}$	5.5 $\mu\mu\text{F}$	5.9 $\mu\mu\text{F}$
Plate to Filament	2.3 $\mu\mu\text{F}$	3.7 $\mu\mu\text{F}$	4.1 $\mu\mu\text{F}$

Note: For Columns B and C, the socket and its mounting metal plate are electrically connected to the filament during measurement.

Technical Summary

The **102D** is a long-life, filamentary triode designed for high-performance voltage amplification, modulation, and detection. Operating with a nominal filament supply of 2.1 Volts at 1.0 Ampere, it provides a high amplification factor of approximately 30, coupled with a plate resistance ranging from 42,000 to 81,000 Ohms depending on the operating point. Its physical design features a four-pin bayonet base with noise-reducing contact tips, compatible with Western Electric 100L and 100R sockets. With an average service life of 70,000 hours under designed conditions, the 102D is engineered for exceptional reliability in continuous-duty applications.



SOURCE OPERATING CONDITIONS

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1956 Western Electric Tubes

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

1956 WESTERN ELECTRIC TUBES

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Plate Voltage	190 V	Catalog-table value



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	2.1 V	—
Filament current	1 A	—
Maximum plate voltage	190 V	—
Plate voltage	130 V	TypicalOperating; Point1
Grid voltage	-2 V	TypicalOperating; Point1
Plate current	0.36 mA	TypicalOperating; Point1
Amplification factor	29.4	TypicalOperating; Point1
Plate resistance	80000 ohm	TypicalOperating; Point1
Transconductance	370 uS	TypicalOperating; Point1
Peak output voltage	27 V	TypicalOperating; Point1
Plate voltage	130 V	TypicalOperating; Point2

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid voltage	-1.5 V	TypicalOperating; Point2
Plate current	0.58 mA	TypicalOperating; Point2
Amplification factor	29.8	TypicalOperating; Point2
Plate resistance	63000 ohm	TypicalOperating; Point2
Transconductance	470 uS	TypicalOperating; Point2
Peak output voltage	20 V	TypicalOperating; Point2
Plate voltage	130 V	TypicalOperating; Point3
Grid voltage	-1 V	TypicalOperating; Point3
Plate current	0.85 mA	TypicalOperating; Point3
Amplification factor	30.1	TypicalOperating; Point3
Plate resistance	53000 ohm	TypicalOperating; Point3
Transconductance	570 uS	TypicalOperating; Point3
Peak output voltage	15 V	TypicalOperating; Point3
Plate voltage	160 V	TypicalOperating; Point4
Grid voltage	-3 V	TypicalOperating; Point4
Plate current	0.34 mA	TypicalOperating; Point4
Amplification factor	29.2	TypicalOperating; Point4
Plate resistance	81000 ohm	TypicalOperating; Point4
Transconductance	360 uS	TypicalOperating; Point4
Peak output voltage	40 V	TypicalOperating; Point4
Plate voltage	160 V	TypicalOperating; Point5
Grid voltage	-2 V	TypicalOperating; Point5
Plate current	0.8 mA	TypicalOperating; Point5
Amplification factor	29.9	TypicalOperating; Point5
Plate resistance	54000 ohm	TypicalOperating; Point5
Transconductance	550 uS	TypicalOperating; Point5
Peak output voltage	28 V	TypicalOperating; Point5
Plate voltage	160 V	TypicalOperating; Point6
Grid voltage	-1 V	TypicalOperating; Point6
Plate current	1.45 mA	TypicalOperating; Point6
Amplification factor	30.3	TypicalOperating; Point6
Plate resistance	42000 ohm	TypicalOperating; Point6

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Transconductance	720 μS	TypicalOperating; Point6
Peak output voltage	15 V	TypicalOperating; Point6
Plate voltage	190 V	MaximumOperating; Point7
Grid voltage	-3 V	MaximumOperating; Point7
Plate current	0.83 mA	MaximumOperating; Point7
Amplification factor	29.8	MaximumOperating; Point7
Plate resistance	54000 ohm	MaximumOperating; Point7
Transconductance	550 μS	MaximumOperating; Point7
Peak output voltage	42 V	MaximumOperating; Point7
Plate voltage	190 V	MaximumOperating; Point8
Grid voltage	-2 V	MaximumOperating; Point8
Plate current	1.46 mA	MaximumOperating; Point8
Amplification factor	30.2	MaximumOperating; Point8
Plate resistance	43000 ohm	MaximumOperating; Point8
Transconductance	700 μS	MaximumOperating; Point8
Peak output voltage	30 V	MaximumOperating; Point8

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	5.6 pF	Based tube without socket
Grid-to-filament capacitance	3.8 pF	Based tube without socket
Plate-to-filament capacitance	2.3 pF	Based tube without socket

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	63000 ohm	Representative published operating point
Transconductance	470 μS	Representative published operating point
Amplification factor	29.8	Representative published operating point