

ELECTRONIC TUBE REFERENCE

10EW7

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

Dissimilar dual triode for television vertical deflection, combining an oscillator section with a low-mu, high-transconductance 10 W output amplifier designed for high pulse voltages.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9NF	BASE PINS	9
NOMINAL HEATER	9.7 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

9NF - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	D2 – 2nd Dynode	CONNECTED
PIN2	–	IS – Internal Screen	CONNECTED
PIN2	–	K – Cathode	CONNECTED
PIN3	–	D2 – 2nd Dynode	CONNECTED
PIN4	–	H – Heater	CONNECTED
PIN5	–	H – Heater	CONNECTED
PIN6	–	G1 – Control Grid	CONNECTED
PIN7	–	D1 – 1st Dynode	CONNECTED
PIN8	–	G2 – Screen Grid	CONNECTED
PIN8	–	G3 – Suppressor Grid	CONNECTED
PIN9	–	P – Plate (Anode)	CONNECTED

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	8750 Ω
TRANSCONDUCTANCE	0.002 S
AMPLIFICATION FACTOR	17.4
MAXIMUM PLATE VOLTAGE	220 V
MAXIMUM PLATE DISSIPATION	1.5 W
MAXIMUM CATHODE CURRENT	22 mA
<i>Vertical-deflection oscillator triode section.</i>	

SECTION2 Triode	
PLATE RESISTANCE	800 Ω
TRANSCONDUCTANCE	0.0075 S
AMPLIFICATION FACTOR	6
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	10 W
MAXIMUM CATHODE CURRENT	40 mA
<i>Vertical-deflection amplifier triode section.</i>	

10EW7 — Dissimilar Double Triode

The **10EW7** is a miniature, dissimilar double triode vacuum tube designed primarily for use in television receivers as a combined vertical-deflection oscillator and vertical-deflection amplifier. It contains two highly distinct triode units within a single envelope: Unit No. 1 is a high-mu triode intended for oscillator service, while Unit No. 2 is a low-mu, high-current triode designed for power amplification in vertical deflection circuits.

The 10EW7 belongs to a family of identical tubes that includes the [6EW7](#), [15EW7](#), [19EW7](#), and [20EW7](#), which differ only in their heater voltage and current ratings.

Construction, Physical Dimensions, and Base

The 10EW7 features a **9T9** bulb design, which consists of a T-9 glass envelope with a 1-1/8 inch diameter based to fit standard 9-pin miniature sockets. The physical dimensions of the tube are:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.620 inches
- **Maximum Overall Height:** 2.930 inches

The tube utilizes a **coated unipotential cathode** for each triode section. It can be mounted in **any position**.

Socket and Base Terminology

Different manufacturers use varying terminology to describe the physical construction and socket requirements of the 10EW7:

- Some documentation lists the construction as **9T9** with a **Button 9-Pin (E9-68)** base and a **9-70** outline.
- Other sources describe the tube as a **Miniature type** requiring a miniature 9-contact socket (with outline 6E) or as a **Neonoval type** requiring a neonoval 9-contact socket (with outline 10C).
- It is also described as utilizing a **9T9 bulb** based to fit most standard 9-pin miniature sockets, with JEDEC outline 9-70 and base E9-68.

Pinout and Basing Diagram

The tube uses the **9HF** basing arrangement, which provides the following pin connections (viewed from the bottom of the tube):

Pin	Connection
1	Plate, Unit No. 2 (<i>PT₂</i>)
2	Grid, Unit No. 2 (<i>GT₂</i>)
3	Grid, Unit No. 2 (<i>GT₂</i>)
4	Heater
5	Heater
6	Plate, Unit No. 1 (<i>PT₁</i>)
7	Grid, Unit No. 1 (<i>GT₁</i>)
8	Cathode, Unit No. 1 (<i>KT₁</i>)
9	Cathode, Unit No. 2 (<i>KT₂</i>)

Unit No. 1 (the oscillator section) is connected to pins 6, 7, and 8. Unit No. 2 (the amplifier section) is connected to pins 1, 2, 3, and 9. The grid of Unit No. 2 is internally connected to both Pin 2 and Pin 3.

Heater Characteristics

The heater of the 10EW7 is designed for series-string or parallel operation. For series heater operation, equipment must be designed so that at normal supply voltage, bogey tubes will operate at the rated heater current.

Parameter	10EW7 Value
Heater Voltage (AC/DC)	9.7 V
Heater Current	0.60 A (600 mA)
Heater Warm-up Time (Approx.)	11.0 seconds

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated voltage after applying four times the rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three times the nominal heater operating resistance.

Heater-Cathode Voltage Ratings

The maximum ratings for the voltage between the heater and cathode are:

- **Heater negative with respect to cathode:** 200 V (Total DC and Peak)
- **Heater positive with respect to cathode:**
 - DC: 100 V
 - Total DC and Peak: 200 V

Electrical Characteristics and Class A1 Operation

The two triode sections of the 10EW7 have highly dissimilar electrical characteristics, optimized for their respective roles:

Characteristic	Unit No. 1 (Oscillator)	Unit No. 2 (Amplifier)
Plate Voltage	250 V	150 V
Grid Voltage	-11 V	-17.5 V
Amplification Factor (μ)	17.5	6.0
Plate Resistance (r_p) (Approx.)	8,750 Ω	800 Ω
Transconductance (g_m)	2,000 μ mhos	7,500 μ mhos
Plate Current (I_b)	5.5 mA	45 mA

Additional Operating Points (Unit No. 2)

- **Plate Current at $E_b = 60$ V, $E_c = 0$ V (Instantaneous):** 95 mA
- **Plate Current at $E_c = -25$ VDC:** 8 mA

Cutoff Characteristics

- **Grid Voltage (Approx.) for $I_b = 10$ μ A (Unit No. 1):** -20 V

- **Grid Voltage (Approx.) for $I_b = 100 \mu\text{A}$ (Unit No. 2):** -40 V

Direct Interelectrode Capacitances

The direct interelectrode capacitances are measured without an external shield:

Capacitance Parameter	Unit No. 1	Unit No. 2
Grid to Plate	4.2 pF	9.0 pF
Input: Grid to (Heater + Cathode)	2.2 pF	7.0 pF
Output: Plate to (Heater + Cathode)	0.4 pF	1.2 pF

Vertical-Deflection Service Ratings

The 10EW7 is rated under the **Design-Maximum Rating System** for operation in a 525-line, 30-frame television system.

Rating Parameter	Unit No. 1 (Oscillator)	Unit No. 2 (Amplifier)
DC Plate Voltage (Max.)	330 V	330 V
Peak Positive-Pulse Plate Voltage (Max.)	—	1,500 V
Peak Negative-Pulse Grid Voltage (Max.)	400 V	250 V
Peak Cathode Current (Max.)	77 mA	175 mA
Average Cathode Current (Max.)	22 mA	50 mA
Plate Dissipation (Max.)	1.5 W	10 W
Maximum Grid-Circuit Resistance (Self Bias)	2.2 M Ω	2.2 M Ω
Maximum Grid-Circuit Resistance (Grid-Resistor Bias)	2.2 M Ω	2.2 M Ω

Pulse Duration and Duty Cycle Discrepancies

For the peak positive-pulse plate voltage rating of Unit No. 2 (1,500 V), the pulse duration must be strictly limited. However, different manufacturer manuals specify this limit differently:

- Some specifications state that the pulse duration must not exceed 15% of a **vertical scanning cycle** (which corresponds to 2.5 milliseconds).
- Other specifications state that the duty cycle of the voltage pulse must not exceed 15% of **one horizontal scanning cycle**.

Grid Leak Bias Protection

In stages operating with grid leak bias, an adequate bias resistor or other suitable means is required to protect the tube in the absence of excitation.

Average Plate Characteristics and Curves

The average plate characteristics of the 10EW7 are documented as follows:

- For Unit No. 1 (the oscillator section), the average plate characteristics are identical to those of **Unit No. 1 of the 6DE7**.
- For Unit No. 2 (the amplifier section), the average plate characteristics are shown in the published curves. The curves plot plate current (ranging from 0 to 140 mA) against plate voltage (ranging from 0 to 400 V) for grid voltages (E_C) from 0 V down to -65 V. These curves illustrate the high-current capability of Unit No. 2 at low plate voltages (e.g., 95 mA at 60 V and 0 V grid bias) and its low plate resistance, which is ideal for driving vertical deflection coils.

Related Designations and Heater Variations

The 10EW7 is part of a family of dissimilar double triodes sharing the same internal structure, pinout (9HF), and electrical characteristics, but utilizing different heater configurations:

Tube Type	Heater Voltage	Heater Current	Heater Warm-up Time
<u>6EW7</u>	6.3 V	0.9 A (900 mA)	—
10EW7	9.7 V	0.6 A (600 mA)	11 seconds
<u>15EW7</u>	14.8 V	0.45 A (450 mA)	11 seconds
<u>19EW7</u>	18.9 V	0.30 A (300 mA)	11 seconds
<u>20EW7</u>	20.5 V	0.30 A (300 mA)	11 seconds

These tubes are electrically identical in their triode characteristics and ratings, meaning that their operating points, capacitances, and maximum ratings are interchangeable, provided the appropriate heater supply is used.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Service	Vertical deflection oscillator	Section1
Heater Warmup Time	11 s	—

1961 TUNG SOL

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Service	Vertical deflection amplifier	Section2



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 2 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	Section1;VerticalOscillator
Plate current	5.5 mA	Section1;VerticalOscillator
Peak negative grid voltage	400 V	Section1;VerticalOscillator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater warm-up time	11 s	WholeTube

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	150 V	Section2;VerticalDeflection
Plate current	45 mA	Section2;VerticalDeflection
Peak positive pulse plate voltage	1500 V	Section2;VerticalDeflection
Peak negative grid voltage	250 V	Section2;VerticalDeflection



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SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1975 RCA RC30

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

1975 RCA RC30

Section 1 · Triode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage (ac/dc)	14.8 volts	Published value from supplied target entry
Heater Current	0.45 ampere	Published value from supplied target entry
Plate Voltage	150 volts	Published value from supplied target entry
Plate Current for plate voltage of	60 volts	Published value from supplied target entry
Grid Voltage (Approx.) for plate current of	-20 volts	Published value from supplied target entry
Grid Voltage (Approx.) for plate current of	-40 volts	Published value from supplied target entry
DC Plate Voltage	330 volts	Published value from supplied target entry
Peak Positive-Pulse Plate Voltage*	1500 volts	Published value from supplied target entry

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak Negative-Pulse Grid Voltage	250 volts	Published value from supplied target entry
Peak Cathode Current	175 mA	Published value from supplied target entry
Average Cathode Current	50 mA	Published value from supplied target entry
Plate Dissipation	10 watts	Published value from supplied target entry
# Pulse duration must not exceed	2.5	Published value from supplied target entry
Heater Voltage (ae/dc)	13 volts	Published value from supplied target entry
Heater Warm-up Time (Average)	11 seconds	Published value from supplied target entry

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Direct Interelectrode Capacitances (Approx.) : Unit No.1 Unit No	2	Published value from supplied target entry
Grid to Plate	9 pF	Published value from supplied target entry
Grid to Cathode and Heater	7 pF	Published value from supplied target entry
Plate to Cathode and Heater	1.2 pF	Published value from supplied target entry
Grid to Plate	10 PF	Published value from supplied target entry
Grid to Cathode and Heater	6.5 PF	Published value from supplied target entry

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