ELECTRONIC TUBE REFERENCE

11CY7

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
TRIODE-TRIODE

Dissimilar dual triode combining a high-mu voltage section with a low-resistance power triode capable of substantial pulse voltage, characteristic of television vertical-deflection circuitry.

General characteristics

BASE DESIGNATION	9NF	**BASE PINS**	9
NOMINAL HEATER	11 V / 450 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	42000 Ω
TRANSCONDUCTANCE	0.0013 S
AMPLIFICATION FACTOR	68
MAXIMUM PLATE VOLTAGE	350 V
MAXIMUM PLATE DISSIPATION	1 W
high-mu	

SECTION2 Triode	
PLATE RESISTANCE	920 Ω
TRANSCONDUCTANCE	0.0054 S
AMPLIFICATION FACTOR	5
MAXIMUM PLATE VOLTAGE	350 V
MAXIMUM PLATE DISSIPATION	5.5 W
MAXIMUM CATHODE CURRENT	35 mA
low-mu	

11CY7 — Dissimilar Double Triode Vacuum Tube

An indirectly heated, dissimilar double triode in a 9-pin miniature construction, designed for use as a combined vertical-deflection oscillator and vertical-deflection amplifier in television receivers.

Overview

The **11CY7** is a miniature double triode containing two electrically distinct and dissimilar triode sections within a single T-6 1/2 glass envelope. Section 1 (Unit No. 1) is a high-mu triode optimized for blocking oscillator or vertical-deflection oscillator service, while Section 2 (Unit No. 2) is a low-mu triode designed for vertical-deflection amplifier service.

The tube is specifically engineered for television receivers employing series heater-string arrangements. To prevent heater voltage surges during the warm-up cycle, the thermal characteristics of the heater are controlled, ensuring uniform heating when operated in series with other similarly controlled tube types.

Construction, Heater, and Basing

The 11CY7 features coated unipotential cathodes and a shared heater designed for series-string operation. It is housed in a T-6 1/2 glass bulb with a small button 9-pin base (E9-1) and utilizes the **9LG**

(or **9EF**) basing arrangement. The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 0.875 inches
- **Maximum Seated Height:** 2.375 inches
- **Maximum Overall Height:** 2.625 inches
- **Mounting Position:** Any

Heater Characteristics and Ratings

The heater is designed for either AC or DC operation. The electrical specifications and heater-to-cathode insulation ratings are:

Heater Parameter	Value
Nominal Heater Voltage	11.0 V
Nominal Heater Current	0.45 A (450 mA) □ 6%
Calculated Heater Power	4.95 W (calculated as $11.0\text{ V} \times 0.45\text{ A}$)
Average Heater Warm-up Time	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 when four times the rated heater voltage (44.0 V) is applied 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 Limits

To ensure reliable operation and prevent insulation breakdown, the voltage between the heater and the cathodes must not exceed the following design-maximum limits:

- **Heater Negative with Respect to Cathode:**
  - Total DC and Peak: 200 V
- **Heater Positive with Respect to Cathode:**
  - DC Component: 100 V
  - Total DC and Peak: 200 V

Dissimilar Triode Sections and Capacitances

Because the 11CY7 contains two highly dissimilar triode units, their internal structures and electrical behaviors differ significantly. Section 1 is a high-mu, high-resistance unit, whereas Section 2 is a low-mu, low-resistance power triode capable of handling much higher currents.

The direct interelectrode capacitances, measured without an external shield, reflect these structural differences:

Capacitance Parameter	Section 1 (Oscillator)	Section 2 (Amplifier)
Grid to Plate	1.8 pF	4.4 pF
Input: g to $(h + k)$	1.5 pF	5.0 pF
Output: p to $(h + k)$	0.30 pF	1.0 pF

Electrical Characteristics and Typical Operating Points

The typical operating conditions and electrical characteristics of each section under Class A1 amplification illustrate the dissimilar nature of the two triodes:

Section 1 (High-Mu Oscillator Unit)

- **Plate Voltage:** 250 V
- **Grid Voltage:** -3.0 V
- **Amplification Factor (μ):** 68
- **Plate Resistance (r_p):** 52,000 Ω (approx.)
- **Transconductance (g_m):** 1,300 μmhos
- **Plate Current:** 1.2 mA
- **Grid Voltage for $I_b = 10$ μA (approx.):** -5.5 V

Section 2 (Low-Mu Amplifier Unit)

- **Plate Voltage:** 150 V
- **Grid Voltage:** Developed via a 620 Ω cathode-bias resistor
- **Amplification Factor (μ):** 5.0
- **Plate Resistance (r_p):** 920 Ω (approx.)
- **Transconductance (g_m):** 5,400 μmhos
- **Plate Current:** 30 mA
- **Plate Current at $E_c = -30$ VDC (approx.):** 3.5 mA
- **Grid Voltage for $I_b = 200$ μA (approx.):** -40 V

An additional typical operating point is specified for Section 2 to define its instantaneous plate knee characteristics:

- **Plate Voltage:** 60 V
- **Grid Voltage:** 0 V
- **Plate Current:** 80 mA

Design-Maximum Ratings

The ratings of the 11CY7 are established under the **Design-Maximum Rating System**. These ratings are limiting values that must not be exceeded under the worst probable operating conditions, taking into account supply-voltage variations, component tolerances, and environmental changes.

Rating Parameter	Section 1 (Vertical Oscillator)	Section 2 (Vertical Deflection Amplifier)
Maximum DC Plate Voltage	350 V	350 V
Maximum Peak Positive Pulse Plate Voltage	—	1,800 V
Maximum Peak Negative Grid Voltage	400 V	250 V
Maximum Plate Dissipation	1.0 W	5.5 W
Maximum DC Cathode Current	—	35 mA
Maximum Peak Cathode Current	—	120 mA
Maximum Grid Circuit Resistance:		
With Fixed Bias	2.2 MΩ	—
With Cathode Bias	2.2 MΩ	2.2 MΩ

Circuit Protection and Pulse Requirements

- **Grid-Leak Bias Protection:** In stages operating with grid-leak bias, an adequate cathode-bias resistor or other suitable protective means must be employed to protect the tube from excessive dissipation in the event that excitation is lost.
- **Television Deflection Service:** For operation in a standard 525-line, 30-frame television system, the duty cycle of the peak voltage pulse must not exceed 15% of one scanning cycle (horizontal scanning cycle).

Characteristic Curves and Qualitative Interpretation

The published characteristic curves for the 11CY7 illustrate the distinct operating regions of the two triode sections:

- **Section 1 Curves:** The plate family curves show that Section 1 operates at low plate currents (typically under 10 mA) and exhibits a relatively flat slope, which is characteristic of high plate resistance ($52,000\ \Omega$). The grid-voltage curves range from positive bias values ($+5\text{ V}$) down to negative values (-6 V), showing a sharp cutoff characteristic. The transfer curves

confirm that transconductance rises rapidly as plate current increases from zero, stabilizing near the typical operating point of 1.2 mA.

- **Section 2 Curves:** The plate family curves for Section 2 display a much steeper slope, indicating a very low plate resistance (920 Ω). This allows the section to conduct high currents (up to 150 mA) at low plate voltages. The grid voltage lines extend down to $-80extV$, demonstrating the large grid-swing capability required for vertical-deflection output stages. The transconductance curve rises steadily with plate current, exceeding 6,000 μmhos at high current levels, while the amplification factor remains stable near 5.0.

Related Designations and Comparisons

The **11CY7** is directly related to other members of the CY7 family:

- **6CY7:** The 11CY7 is electrically identical to the **6CY7** except for its heater ratings. The 6CY7 utilizes a 6.3 V, 0.75 A heater, whereas the 11CY7 is optimized for series-string operation with its 11.0 V, 0.45 A heater.
- **8CY7:** Sylvania also documents the **8CY7**, which features a 7.9 V, 0.60 A heater but shares the same internal triode structures and ratings.

These designations represent heater variations of the same underlying tube design. Consequently, while they share identical electrical characteristics for both triode sections, they are not pin-for-pin drop-in replacements due to their incompatible heater voltage and current requirements.

Technical Summary

The **11CY7** is a **9-pin miniature, dissimilar double triode** designed specifically for television vertical-deflection circuits. It combines a high-mu oscillator triode ($\mu = 68$) and a low-mu power amplifier triode ($\mu = 5.0$) in a single T-6 1/2 envelope. Operating from an **11.0 V, 0.45 A** heater supply with a controlled 11-second warm-up time, it is ideally suited for series heater-string applications. By integrating both the vertical oscillator and the output amplifier into a single envelope, the 11CY7 provides a compact and efficient solution for television receiver designs, provided that its design-maximum ratings and pulse duty-cycle limits are strictly observed.

SOURCE OPERATING CONDITIONS

1961 Tung Sol

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1961 TUNG SOL

Section 1 · Triode

CAPACITANCE		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Grid to Plate	**1.8 pF**	—
Input Capacitance	**1.5 pF**	—
Output Capacitance	**0.3 pF**	—

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Max Imum Peak Positive Pulse Plate Voltage	**1800 V**	—
Max Imum Dc Cathode Current —	**3 mA**	—
Maximum Dc Peak Cathode Current —	**120 mA**	—
Heater Warm—Up T|Me (Approx.)*	**11 s**	—
Grid Voltage	**-3 V**	—
Cathode~Bias Resistor _— —	**620 ohm**	—

1961 TUNG SOL

Section 2 · Triode

CAPACITANCE		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Grid to Plate	**4.4 pF**	—
Input Capacitance	**5 pF**	—
Output Capacitance	**1 pF**	—

SOURCE OPERATING CONDITIONS

1966 Tung Sol Electronic Tubes 2 of 4

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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	**1.2 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	**30 mA**	Section2;VerticalDeflection
Peak positive pulse plate voltage	**1500 V**	Section2;VerticalDeflection
Peak negative grid voltage	**250 V**	Section2;VerticalDeflection

SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1971 RCA HB3 Binder 5 of 7

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1971 RCA HB3 BINDER 5 OF 7

Section 1 · Triode

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Maximum Plate Voltage	**330 V**	Inherited from explicitly referenced 6-volt parent type
Plate Dissipation	**1.5 W**	Inherited from explicitly referenced 6-volt parent type

CHARACTERISTICS		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Transconductance	**1500 µS**	Inherited from explicitly referenced 6-volt parent type
Amplification Factor	**60**	Inherited from explicitly referenced 6-volt parent type

Section 2 · Triode

OTHER		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Maximum Plate Voltage	**330 V**	Inherited from explicitly referenced 6-volt parent type
Plate Dissipation	**10 W**	Inherited from explicitly referenced 6-volt parent type

CHARACTERISTICS		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Transconductance	**7000 µS**	Inherited from explicitly referenced 6-volt parent type
Amplification Factor	**6**	Inherited from explicitly referenced 6-volt parent type

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