

ELECTRONIC TUBE REFERENCE

CONSOLIDATED TECHNICAL DATA

10AF11

3 SECTIONS

CONSTRUCTION

Voltage - Dual Triode Pentode electronic tube

PENTODE-TRIODE-TRIODE

Compactron triple-section tube with high-mu triode, medium-mu triode and sharp-cutoff pentode for AGC keying, sync separation and video amplification.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12DP	BASE PINS	12
NOMINAL HEATER	9.8 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

12DP - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	H – Heater	CONNECTED
PIN2	A	P – Plate (Anode)	CONNECTED
PIN3	C	G1 – Control Grid	CONNECTED
PIN4	C	P – Plate (Anode)	CONNECTED
PIN5	B	K – Cathode	CONNECTED
PIN6	B	G3 – Suppressor Grid	CONNECTED
PIN7	C	K – Cathode	CONNECTED
PIN7	–	IS – Internal Screen	CONNECTED
PIN8	B	P – Plate (Anode)	CONNECTED
PIN9	A	G3 – Suppressor Grid	CONNECTED
PIN9	A	K – Cathode	CONNECTED
PIN10	A	G2 – Screen Grid	CONNECTED
PIN11	A	G1 – Control Grid	CONNECTED

TERMINAL	SECTION	ELEMENT	STATUS
PIN12	—	H – Heater	CONNECTED

SECTION RATINGS

SECTION1 Triode		
PLATE RESISTANCE		12400 Ω
TRANSCONDUCTANCE		0.0055 S
AMPLIFICATION FACTOR		68
MAXIMUM PLATE VOLTAGE		330 V
MAXIMUM PLATE DISSIPATION		1.1 W
<i>High-mu triode 1; typical V_a 200 V, V_g -2.0 V, I_a 7.0 mA. C_{gp} 1.9 pF, C_{in} 3.0 pF, C_{out} 2.2 pF. Grid circuit resistance max fixed bias 0.5 MΩ, cathode bias 1.0 MΩ.</i>		

SECTION2 Triode		
PLATE RESISTANCE		9400 Ω
TRANSCONDUCTANCE		0.0044 S
AMPLIFICATION FACTOR		41
MAXIMUM PLATE VOLTAGE		330 V
MAXIMUM PLATE DISSIPATION		2 W
<i>Medium-mu triode 2; typical V_a 200 V, R_k 220 Ω, I_a 9.2 mA. C_{gp} 3.6 pF, C_{in} 2.4 pF, C_{out} 3.8 pF. Grid circuit resistance max fixed bias 0.5 MΩ, cathode bias 1.0 MΩ.</i>		

SECTION3 Pentode		
PLATE RESISTANCE		68000 Ω
TRANSCONDUCTANCE		0.011 S
MAXIMUM PLATE VOLTAGE		330 V
MAXIMUM SCREEN VOLTAGE		330 V
MAXIMUM PLATE DISSIPATION		5 W
MAXIMUM SCREEN DISSIPATION		1.25 W
<i>Sharp-cutoff pentode; typical conditions: V_a 50 V, V_s 150 V, V_{g1} 0 V, I_a 55 mA, I_s 18 mA; alternatively V_a 200 V, V_s 150 V, R_k 100 Ω, I_a 24 mA, I_s 4.8 mA. r_p 68kΩ and g_m 11mS at 200V. C_{gp} 0.12 pF, C_{in} 10 pF, C_{out} 4.5 pF. Grid circuit resistance max fixed bias 0.25 MΩ, cathode bias 1.0 MΩ.</i>		

10AF11 — Triple-Section Compactron Vacuum Tube

The **10AF11** is a multi-section vacuum tube designed in the Compactron envelope configuration. It integrates three distinct active electronic systems within a single glass envelope: a high- μ triode (designated Triode No. 1), a medium- μ triode (designated Triode No. 2), and a sharp-cutoff pentode. This combination of diverse tube structures is specifically tailored for television receiver applications, serving functions such as an automatic gain control (AGC) keyer, a sync separator, and a video amplifier.

Mechanical Construction, Base, and Physical Dimensions

The 10AF11 is built using the Compactron T-9 construction style, which provides a compact, multi-pin layout suitable for high-density chassis designs. The tube features a button 12-pin base, designated as the E12-70 type, and utilizes the 12DP basing arrangement.

The physical dimensions of the device are defined by the 9-58 outline specification:

- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.250 inches
- **Maximum Overall Height:** 2.625 inches

Heater Specifications and Ratings

The heater of the 10AF11 is designed for series-string operation, featuring a controlled warm-up characteristic. The heater parameters and electrical insulation limits between the heater and the cathodes are as follows:

Parameter	Value
Heater Connection	Series
Heater Voltage	9.8 V
Heater Current	600 mA
Heater Warm-up Time	11 seconds

Heater-Cathode Voltage Limits

To prevent insulation breakdown and minimize noise, the potential difference between the heater and the individual cathodes must be kept within the following design-maximum limits:

- **Heater Negative with Respect to Cathode:** 200 Volts maximum (Total DC and Peak)
- **Heater Positive with Respect to Cathode:**
 - DC: 100 Volts maximum

- Total DC and Peak: 200 Volts maximum

Electrical Characteristics and Typical Operating Points

Each of the three sections in the 10AF11 exhibits distinct electrical characteristics optimized for its respective role.

Triode No. 1 (High-Mu Triode)

Triode No. 1 is designed for high voltage gain. Under typical operating conditions, it exhibits the following characteristics:

- **Plate Voltage:** 200 V
- **Grid Voltage:** -2.0 V
- **Amplification Factor (μ):** 68
- **Plate Resistance (Approximate):** 12,400 Ω
- **Transconductance (g_m):** 5,500 μmhos
- **Plate Current:** 7.0 mA
- **Grid Voltage for Cutoff (at $I_b = 10 \mu\text{A}$):** -5.5 V (approximate)

Triode No. 2 (Medium-Mu Triode)

Triode No. 2 offers moderate amplification with lower plate resistance and higher current capability. Its typical operation is specified using cathode bias:

- **Plate Voltage:** 200 V
- **Cathode-Bias Resistor:** 220 Ω
- **Amplification Factor (μ):** 41
- **Plate Resistance (Approximate):** 9,400 Ω
- **Transconductance (g_m):** 4,400 μmhos
- **Plate Current:** 9.2 mA
- **Grid Voltage for Cutoff (at $I_b = 10 \mu\text{A}$):** -6.5 V (approximate)

Pentode Section (Sharp Cutoff)

The pentode section is characterized under two distinct operating conditions to illustrate its performance in different circuit configurations:

Parameter	Condition A	Condition B
Plate Voltage	50 V	200 V
Screen Voltage	150 V	150 V
Grid No. 1 Voltage	0 V	—

Parameter	Condition A	Condition B
Cathode-Bias Resistor	—	100 μ 3a9
Plate Resistance (Approximate)	—	68,000 μ 3a9
Transconductance (g_m)	—	11,000 μ 3bcmhos
Plate Current	55 mA	24 mA
Screen Current	18 mA	4.8 mA
Grid No. 1 Cutoff Voltage (at $I_b = 100 \mu$ A)	—	-10 V (approximate)

Design-Maximum Ratings

The design-maximum rating system defines the absolute limits within which the 10AF11 must be operated to ensure reliability and longevity. These ratings are specified individually for each section:

Triode No. 1

- **Plate Voltage:** 330 V maximum
- **Positive DC Grid Voltage:** 0 V maximum
- **Plate Dissipation:** 1.1 W maximum
- **Maximum Grid Circuit Resistance:**
 - Fixed Bias: 0.5 M μ 3a9
 - Cathode Bias: 1.0 M μ 3a9

Triode No. 2

- **Plate Voltage:** 330 V maximum
- **Positive DC Grid Voltage:** 0 V maximum
- **Plate Dissipation:** 2.0 W maximum
- **Maximum Grid Circuit Resistance:**
 - Fixed Bias: 0.5 M μ 3a9
 - Cathode Bias: 1.0 M μ 3a9

Pentode Section

- **Plate Voltage:** 330 V maximum
- **Screen Supply Voltage:** 330 V maximum
- **Positive DC Grid No. 1 Voltage:** 0 V maximum
- **Plate Dissipation:** 5.0 W maximum
- **Screen Dissipation:** 1.25 W maximum

- **Maximum Grid No. 1 Circuit Resistance:**

- Fixed Bias: 0.25 MΩ
- Cathode Bias: 1.0 MΩ

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 10AF11 are measured without an external shield. The input and output capacitance values are referenced to specific internal elements and the heater.

Section-Specific Capacitances

- **Triode No. 1:**

- Grid to Plate: 1.9 pF
- Input ($1Tg1$ to $[1Tk + 2Tk + Pk + Pg3 + h + IS]$): 3.0 pF
- Output ($1Tp$ to $[1Tk + 2Tk + Pk + Pg3 + h + IS]$): 2.2 pF

- **Triode No. 2:**

- Grid to Plate: 3.6 pF
- Input ($2Tg1$ to $[2Tk + Pk + Pg3 + h + IS]$): 2.4 pF
- Output ($2Tp$ to $[2Tk + Pk + Pg3 + h + IS]$): 3.8 pF

- **Pentode Section:**

- Grid to Plate: 0.12 pF
- Input ($Pg1$ to $[2Tk + Pk + Pg2 + Pg3 + h + IS]$): 10.0 pF
- Output (Pp to $[2Tk + Pk + Pg2 + Pg3 + h + IS]$): 4.5 pF

(Note: $1Tg1$, $2Tg1$, and $Pg1$ represent the control grids; $1Tp$, $2Tp$, and Pp represent the plates; $1Tk$, $2Tk$, and Pk represent the cathodes; $Pg2$ and $Pg3$ represent the pentode screen and suppressor grids; h represents the heater; and IS represents the internal shield.)

Inter-Section Coupling

To minimize crosstalk and unwanted feedback between the independent sections, the internal layout is designed for low capacitive coupling:

- **Pentode Plate to Triode No. 2 Plate:** 0.045 pF maximum
- **Triode No. 1 Plate to Triode No. 2 Plate:** 0.06 pF maximum

Technical Summary

The **10AF11** is a versatile Compactron vacuum tube containing three independent active sections: a high- μ triode, a medium- μ triode, and a sharp-cutoff pentode. Operating with a 9.8 V, 600 mA series heater, it is optimized for television receiver circuitry, specifically as an AGC keyer, sync separator, and video amplifier. By combining these three distinct structures into a single T-9 envelope with a 12-pin button base, the 10AF11 reduces component count and space requirements while maintaining high performance across all three stages.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1970 Sylvania Technical Manual

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

1970 SYLVANIA TECHNICAL MANUAL

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid To Plate Capacitance	1.9 pF	Unshielded, direct interelectrode capacitance
Input Capacitance	3 pF	Unshielded input capacitance
Output Capacitance	2.2 pF	Unshielded output capacitance
Plate Voltage	200 V	Typical triode 1
Grid Voltage	-2 V	Typical triode 1
Plate Current	7 mA	Typical triode 1
Heater Warmup Time	11 s	10AF11 heater warm-up time

1970 SYLVANIA TECHNICAL MANUAL

Section 2 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid To Plate Capacitance	3.6 pF	Unshielded, direct interelectrode capacitance
Input Capacitance	2.4 pF	Unshielded input capacitance
Output Capacitance	3.8 pF	Unshielded output capacitance
Plate Voltage	200 V	Typical triode 2
Cathode Bias Resistor	220 Ω	Typical triode 2 cathode bias
Plate Current	9.2 mA	Typical triode 2

1970 SYLVANIA TECHNICAL MANUAL

Section 3 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid To Plate Capacitance	0.12 pF	Unshielded, direct interelectrode capacitance

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Input Capacitance	10 pF	Unshielded input capacitance
Output Capacitance	4.5 pF	Unshielded output capacitance
Plate Voltage	50 V	Typical operating point 1
Screen Voltage	150 V	Typical operating point 1
Grid Voltage	0 V	Typical operating point 1
Plate Current	55 mA	Typical operating point 1
Screen Current	18 mA	Typical operating point 1
Plate Voltage	200 V	Typical operating point 2
Screen Voltage	150 V	Typical operating point 2
Cathode Bias Resistor	100 Ω	Typical operating point 2
Plate Current	24 mA	Typical operating point 2
Screen Current	4.8 mA	Typical operating point 2

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