

ELECTRONIC TUBE REFERENCE

12AZ7A

Voltage - Dual Triode (similar) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

TRIODE-TRIODE

High-mu miniature twin triode for resistance-coupled voltage amplification and phase inversion, an improved 12AZ7-family version intended for general amplifier service.

GENERAL CHARACTERISTICS

BASE DESIGNATION	9A	BASE PINS	9
NOMINAL HEATER	12.6 V / 225 mA	PARALLEL HEATER	6.3 V / 450 mA
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

9A - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – 2P	B	P – Plate (Anode)	CONNECTED
PIN2 – 2G1	B	G1 – Control Grid	CONNECTED
PIN3 – 2K	B	K – Cathode	CONNECTED
PIN4 – H	–	H – Heater	CONNECTED
PIN5 – H	–	H – Heater	CONNECTED
PIN6 – 1P	A	P – Plate (Anode)	CONNECTED
PIN7 – 1G1	A	G1 – Control Grid	CONNECTED
PIN8 – 1K	A	K – Cathode	CONNECTED
PIN9 – HCT	–	HCT – Heater Center Tap	CONNECTED

SECTION RATINGS

SECTION1 Triode	
PLATE RESISTANCE	10900 Ω
TRANSCONDUCTANCE	0.0055 S
AMPLIFICATION FACTOR	60
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	2.5 W
<i>Representative row for electrically identical repeated sections.</i>	

SECTION2 Triode	
PLATE RESISTANCE	10900 Ω
TRANSCONDUCTANCE	0.0055 S
AMPLIFICATION FACTOR	60
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	2.5 W
<i>High-mu controlled-warm-up triode; curves shared with 12AT7.</i>	

12AZ7A — High-Mu Twin Triode

The **12AZ7A** is a miniature, nine-pin double triode vacuum tube featuring two independent triode sections with a common heater. It is designed for a variety of high-frequency and audio applications, most notably as a grounded-grid radio frequency (RF) amplifier, a direct-coupled cathode-drive RF amplifier, or a combined oscillator-mixer in VHF television tuners (supporting both color and black-and-white systems). Additionally, the tube is suitable for audio amplifier applications.

While some technical descriptions classify the 12AZ7A as containing two independent medium-mu triodes, its typical amplification factor of 60 leads other references to designate it as a high-mu twin triode. Each triode section is electrically independent except for their shared heater connections.

Mechanical Construction, Base, and Pinout

The 12AZ7A is constructed in a miniature T-6 1/2 glass bulb with a small-button noval 9-pin base (JEDEC No. E9-1, outline drawing JEDEC 6-2). The tube features coated unipotential cathodes and can be operated in any mounting position.

Physical Dimensions

- **Maximum Overall Length:** 2-3/16 inches (2.187 in)
- **Maximum Seated Length:** 1-15/16 inches (1.937 in)
- **Length from Base Seat to Bulb Top (excluding tip):** 1-9/16" $\pm$ 3/32"

- **Diameter Range:** 0.750 to 0.875 inches

Pin Connection Diagram (JEDEC 9A)

The 9A basing arrangement provides independent connections for both triode sections, viewed from the bottom of the tube:

Pin	Connection
Pin 1	Plate of Unit No. 2
Pin 2	Grid of Unit No. 2
Pin 3	Cathode of Unit No. 2
Pin 4	Heater of Unit No. 2
Pin 5	Heater of Unit No. 1
Pin 6	Plate of Unit No. 1
Pin 7	Grid of Unit No. 1
Pin 8	Cathode of Unit No. 1
Pin 9	Heater Tap

Pins 4, 5, and 9 allow the heater to be wired in either a series or parallel configuration.

Heater Characteristics and Controlled Warm-Up

The 12AZ7A is designed with a controlled heater warm-up time, making it suitable for series-string or parallel heater circuits.

Heater Ratings and Supply Limits

- **Series Connection:**
 - Nominal Voltage: 12.6 V (AC or DC)
 - Voltage Supply Limits: 12.6 ± 1.3 V (or $\pm 10\%$)
 - Nominal Current: 0.225 A (225 mA)
- **Parallel Connection:**
 - Nominal Voltage: 6.3 V (AC or DC)
 - Current Supply Limits: $0.45 \pm 6\%$ A (450 ± 30 mA)
- **Average Heater Warm-up Time:** 11 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 4 times the rated heater voltage to a circuit consisting of the tube heater in series with a resistance of value 3 times the nominal heater operating resistance.

Heater-Cathode Voltage Limits

The maximum allowable voltage between the heater and cathode depends on the rating system applied:

- **Design-Maximum Ratings:**

- Heater negative with respect to cathode: 200 V max (Total DC and Peak)
- Heater positive with respect to cathode: 200 V max (Total DC and Peak), with the DC component not exceeding 100 V.

- **Design-Center Ratings:**

- Maximum Heater-Cathode Voltage: 90 V

Electrical Characteristics and Typical Operating Points

The 12AZ7A exhibits high transconductance and moderate-to-high amplification. For typical Class A1 amplifier operation, the characteristics of each individual triode section are evaluated at two primary operating points:

Parameter	Operating Point A	Operating Point B
Plate Supply Voltage	100 V	250 V
Cathode Bias Resistor	270 Ω	200 Ω
Plate Current	3.7 mA	10 mA
Transconductance	4,000 μmhos	5,500 μmhos
Amplification Factor	60	60
Plate Resistance (Approx.)	15,000 Ω	10,900 Ω
Grid Voltage (Approx.) for $I_b = 10 \mu\text{A}$	-5 V	-12 V

For additional Class A1 amplifier characteristics and curves, technical references specify that the curves and characteristics shown under miniature type [12AT7](#) also apply directly to the 12AZ7A.

Interelectrode Capacitances

The direct interelectrode capacitances of the 12AZ7A vary depending on whether an external shield is used. Measurements with a shield are typically performed using JEDEC No. 315 external shield connected to the cathode of the unit under test.

Standard Operation (Each Section)

Two sets of values are documented in technical specifications, reflecting minor variations in measurement conditions:

Capacitance Parameter	Unshielded (Set 1)	Shielded (Set 1)	Unshielded (Set 2)	Shielded (Set 2)
Grid to Plate	2.0 pF	1.9 pF	1.9 pF	1.9 pF
Input (Grid to Cathode + Heater)	2.6 pF	2.8 pF	3.1 pF	3.2 pF
Output (Plate to Cathode + Heater) - Unit 1	0.44 pF	1.4 pF	0.5 pF	1.3 pF
Output (Plate to Cathode + Heater) - Unit 2	0.36 pF	1.6 pF	0.4 pF	1.6 pF

Grounded-Grid Operation (Each Section)

For high-frequency grounded-grid applications, the capacitances are specified as follows:

Capacitance Parameter	Unshielded	Shielded
Input (Each Section)	6.9 pF	7.0 pF
Output (Section 1)	2.0 pF	2.8 pF
Output (Section 2)	2.0 pF	3.2 pF
Plate to Cathode	0.24 pF	0.23 pF

Maximum Ratings and Circuit Constraints

To ensure reliable operation and prevent premature failure, circuit designers must adhere to the maximum ratings. These ratings are published under two different rating systems and must not be exceeded.

Maximum Ratings Comparison

Parameter	Design-Maximum Values	Design-Center Values
Plate Voltage	330 V	300 V
Negative Grid Voltage	55 V	50 V
Plate Dissipation (Each Section)	2.5 W	2.5 W
Total Plate Dissipation (Both Sections)	5.0 W	—

Maximum Grid-Circuit Resistance

The maximum allowable resistance in the grid circuit of each unit is constrained by the biasing method to prevent thermal runaway:

- **For Fixed-Bias Operation:** 0.25 Megohm maximum
- **For Cathode-Bias (Self-Bias) Operation:** 1.0 Megohm maximum



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
Plate Voltage	150 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Current	6 mA	—



SOURCE OPERATING CONDITIONS

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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

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID TO PLATE: (G TO P) EACH SECTION	1.9 pF	Published datasheet; operating column 1
GRID TO PLATE: (G TO P) EACH SECTION	2 pF	Published datasheet; operating column 2

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
INPUT; G TO (H+K) EACH SECTION	2.8 pF	Published datasheet; operating column 1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
INPUT; G TO (H+K) EACH SECTION	2.6 pF	Published datasheet; operating column 2
HEATER IN SERIES	12.6 mA	Published datasheet; operating column 1
HEATER IN SERIES	225 mA	Published datasheet; operating column 2
HEATER IN PARALLEL	6.3 mA	Published datasheet; operating column 1
HEATER IN PARALLEL	450 mA	Published datasheet; operating column 2
HEATER WARM-UP TIME	8 s	Published datasheet; operating column 1
HEATER WARM-UP TIME	11 s	Published datasheet; operating column 2
TOTAL DC AND PEAK	200 V	Published datasheet
PLATE DISSIPATION (EACH SECTION)	2.5 W	Published datasheet
TOTAL PLATE DISSIPATION	5 W	Published datasheet
FIXED BIAS	0.25 Mohm	Published datasheet
SELF BIAS	1 Mohm	Published datasheet
CATHODE BIAS RESISTOR	270 ohm	Published datasheet; operating column 1
CATHODE BIAS RESISTOR	200 ohm	Published datasheet; operating column 2
CATHODE BIAS RESISTOR	0 ohm	Published datasheet; operating column 3
Maximum plate voltage	300 V	Published datasheet; promoted section value
Maximum plate dissipation	2.5 W	Published datasheet; promoted section value

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
VOLTAGE	0 V	Published datasheet; operating column 1
VOLTAGE	12.6 V	Published datasheet; operating column 2
VOLTAGE	1.3 V	Published datasheet; operating column 3
CURRENT	0 mA	Published datasheet; operating column 1
CURRENT	450 mA	Published datasheet; operating column 2
CURRENT	30 mA	Published datasheet; operating column 3
PLATE VOLTAGE	330 V	Published datasheet
NEGATIVE DC GRID VOLTAGE	55 V	Published datasheet
PLATE VOLTAGE	100 V	Published datasheet; operating column 1
PLATE VOLTAGE	250 V	Published datasheet; operating column 2
PLATE CURRENT	3.7 mA	Published datasheet; operating column 1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PLATE CURRENT	10 mA	Published datasheet; operating column 2
PLATE RESISTANCE (APPROX.)	15000 ohm	Published datasheet; operating column 1
PLATE RESISTANCE (APPROX.)	10900 ohm	Published datasheet; operating column 2
PLATE RESISTANCE (APPROX.)	0 ohm	Published datasheet; operating column 3
FOR	16 V	Published datasheet; operating column 1
FOR	101 V	Published datasheet; operating column 2
FOR	-5 V	Published datasheet; operating column 3
Plate resistance	10900 ohm	Published datasheet; promoted section value
Transconductance	0.0055 A/V	Published datasheet; promoted section value
Amplification factor	60	Published datasheet; promoted section value



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1971 RCA HB3 Binder 5 of 7

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

1971 RCA HB3 BINDER 5 OF 7

Section 1 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage series	12.6 V	SeriesHeater
Heater current series	225 mA	SeriesHeater
Heater voltage parallel	6.3 V	ParallelHeater
Heater current parallel	450 mA	ParallelHeater
Heater warm-up time	11 s	Average
Plate supply voltage	100 V	ClassA1;PublishedPoint1
Plate supply voltage	250 V	ClassA1;PublishedPoint2
Cathode resistor	270 ohm	ClassA1;PublishedPoint1
Cathode resistor	200 ohm	ClassA1;PublishedPoint2
Amplification factor	60	ClassA1
Plate resistance	15000 ohm	ClassA1;PublishedPoint1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	10900 ohm	ClassA1;PublishedPoint2
Transconductance	4000 μ S	ClassA1;PublishedPoint1
Transconductance	5500 μ S	ClassA1;PublishedPoint2
Plate current	3.7 mA	ClassA1;PublishedPoint1
Plate current	10 mA	ClassA1;PublishedPoint2

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	330 V	ClassA1
Maximum negative grid bias	55 V	ClassA1
Maximum plate dissipation	2.5 W	ClassA1
Peak heater-cathode voltage	200 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	2 pF	WithoutExternalShield
Grid-to-plate capacitance	1.9 pF	WithExternalShield
Grid-to-cathode-and-heater capacitance	2.6 pF	WithoutExternalShield
Grid-to-cathode-and-heater capacitance	2.8 pF	WithExternalShield
Plate-to-cathode-and-heater capacitance	0.44 pF	WithoutExternalShield
Plate-to-cathode-and-heater capacitance	1.4 pF	WithExternalShield

1971 RCA HB3 BINDER 5 OF 7

Section 2 · Triode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage series	12.6 V	SeriesHeater
Heater current series	225 mA	SeriesHeater
Heater voltage parallel	6.3 V	ParallelHeater
Heater current parallel	450 mA	ParallelHeater
Heater warm-up time	11 s	Average
Plate supply voltage	100 V	ClassA1;PublishedPoint1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate supply voltage	250 V	ClassA1;PublishedPoint2
Cathode resistor	270 ohm	ClassA1;PublishedPoint1
Cathode resistor	200 ohm	ClassA1;PublishedPoint2
Amplification factor	60	ClassA1
Plate resistance	15000 ohm	ClassA1;PublishedPoint1
Plate resistance	10900 ohm	ClassA1;PublishedPoint2
Transconductance	4000 μ S	ClassA1;PublishedPoint1
Transconductance	5500 μ S	ClassA1;PublishedPoint2
Plate current	3.7 mA	ClassA1;PublishedPoint1
Plate current	10 mA	ClassA1;PublishedPoint2

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	330 V	ClassA1
Maximum negative grid bias	55 V	ClassA1
Maximum plate dissipation	2.5 W	ClassA1
Peak heater-cathode voltage	200 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	2 pF	WithoutExternalShield
Grid-to-plate capacitance	1.9 pF	WithExternalShield
Grid-to-cathode-and-heater capacitance	2.6 pF	WithoutExternalShield
Grid-to-cathode-and-heater capacitance	2.8 pF	WithExternalShield
Plate-to-cathode-and-heater capacitance	0.36 pF	WithoutExternalShield
Plate-to-cathode-and-heater capacitance	1.6 pF	WithExternalShield



SOURCE DATA APPENDIX

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
Plate Resistance	22800 ohms	Published value from supplied target entry
Transconductance	1750	Published value from supplied target entry
Plate Current	3 mA	Published value from supplied target entry
Grid Voltage (Approx.) for plate current of	11 mA	Published value from supplied target entry
Heater Warm-up Time (Average)	11 seconds	Published value from supplied target entry
Plate Voltage	330 volts	Published value from supplied target entry
Grid Voltage, Negative-bias value	55 volts	Published value from supplied target entry
Plate Dissipation	2.5 watts	Published value from supplied target entry
Heater Voltage	6.3 volts	Published value from supplied target entry
Heater Current	0.6 ampere	Published value from supplied target entry
Heater Warm-up Time	11 seconds	Published value from supplied target entry
Plate Voltage	550 volts	Published value from supplied target entry
Grid Voltage, Negative-bias value	50 volts	Published value from supplied target entry
Plate Dissipation	5.5 watts	Published value from supplied target entry
Plate Voltage	150 volts	Published value from supplied target entry
Grid Voltage	-17.5 volts	Published value from supplied target entry
Amplification Factor	6.5	Published value from supplied target entry
Plate Resistance (Approx.)	1030 ohms	Published value from supplied target entry
Transconductance	6300	Published value from supplied target entry
Plate Current	34	Published value from supplied target entry
Grid Voltage (Approx.) for plate current of	-32 volts	Published value from supplied target entry
DC Plate Voltage	550 volts	Published value from supplied target entry

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate (Each unit)	1.9 pF	Published value from supplied target entry
Grid to Cathode and Heater (Each unit)	2.8 pF	Published value from supplied target entry
Grid to Plate	4.8 pF	Published value from supplied target entry
Grid to Cathode and Heater	5 pF	Published value from supplied target entry
Plate to Cathode and Heater	-5 pF	Published value from supplied target entry

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