

ELECTRONIC TUBE REFERENCE

10Z10

Power - Pentode (NOT beam) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

BEAMPOWER-PENTODE

Beam-power receiving tube intended primarily for audio-frequency output service in television or radio equipment using series-connected heater supplies.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12BT	BASE PINS	12
NOMINAL HEATER	10 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

12BT - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	H – Heater	CONNECTED
PIN2	B	G2 – Screen Grid	CONNECTED
PIN3	B	G3 – Suppressor Grid	CONNECTED
PIN3	B	K – Cathode	CONNECTED
PIN4	A	P – Plate (Anode)	CONNECTED
PIN5	A	G3 – Suppressor Grid	CONNECTED
PIN6	A	G2 – Screen Grid	CONNECTED
PIN7	A	G1 – Control Grid	CONNECTED
PIN8	A	K – Cathode	CONNECTED
PIN8	–	IS – Internal Screen	CONNECTED
PIN9	B	P – Plate (Anode)	CONNECTED
PIN11	B	G1 – Control Grid	CONNECTED
PIN12	–	H – Heater	CONNECTED

SECTION RATINGS

SECTION1 Pentode	
TRANSCONDUCTANCE	0.0007 S
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM SCREEN VOLTAGE	330 V
MAXIMUM CATHODE CURRENT	13 mA
<i>Gated-beam discriminator. Source is a product-information/reference sheet and does not print the referenced base tube's section ratings/characteristics; promoted fields intentionally not inferred from an external datasheet.</i>	

SECTION2 Beam Power	
PLATE RESISTANCE	100000 Ω
TRANSCONDUCTANCE	0.0065 S
MAXIMUM PLATE VOLTAGE	275 V
MAXIMUM SCREEN VOLTAGE	275 V
MAXIMUM PLATE DISSIPATION	10 W
MAXIMUM SCREEN DISSIPATION	2 W
<i>Source is a product-information/reference sheet and does not print the referenced base tube's section ratings/characteristics; promoted fields intentionally not inferred from an external datasheet.</i>	

10Z10 — Compactron Gated-Beam Discriminator and Power Pentode

The **10Z10** is a multi-unit vacuum tube of the compactron design, housing two independent electrical systems within a single T-9 glass envelope: a gated-beam discriminator and a beam power pentode. It is designed primarily for use in television and FM radio receivers, where the gated-beam discriminator serves as a combined limiter and discriminator, and the pentode section functions as an audio power-output amplifier.

The 10Z10 is identical to the [6Z10](#) (also designated [6Z10/6J10](#)) and the [13Z10](#) (also designated [13Z10/13J10](#)) except for its heater characteristics and ratings. It requires a standard 12-contact duodecar socket for operation.

Heater Characteristics and Operation

The 10Z10 features a coated unipotential cathode structure with heater ratings optimized for series-string or specific parallel power arrangements.

Parameter	Value
Heater Voltage (AC or DC)	10.0 V
Heater Current	0.6 $\pm$ 0.04 A
Average Heater Warm-up Time	11 seconds
Cathode Type	Coated Unipotential

Heater-Cathode Voltage Ratings

To ensure insulation integrity between the heater and the separate cathodes of each section, the following maximum voltage limits must be observed:

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

Heater Design Considerations

The nominal heater voltage of 10.0 V is specified for a "bogey" tube drawing exactly 0.6 amperes. Equipment designers must ensure that the heater current is centered at this bogey value, with supply variations restricted to keep the current within the specified ± 0.04 A tolerance.

The average heater warm-up time of 11 seconds is defined under specific test conditions: the time required for the voltage across the heater to reach 80% of its bogey value (8.0 V) when 4 times the bogey voltage (40.0 V) is applied to a circuit consisting of the heater in series with a resistance equal to 3 times the bogey heater voltage divided by the bogey heater current.

- **Bogey Heater Resistance Calculation:** $\text{Resistance} = \frac{\text{Heater Voltage}}{\text{Heater Current}} = \frac{10.0 \text{ V}}{0.6 \text{ A}} \approx 16.67 \Omega$
- **Series Test Resistance Calculation:** $\text{Series Resistance} = 3 \times 16.67 \Omega = 50.0 \Omega$
- **Heater Power Consumption Calculation:** $\text{Power} = \text{Heater Voltage} \times \text{Heater Current} = 10.0 \text{ V} \times 0.6 \text{ A} = 6.0 \text{ W}$

Physical Specifications and Pinout

The 10Z10 utilizes the compactron T-9 construction, which provides a compact physical profile with excellent mechanical stability.

Physical Dimensions

- **Outline Designation:** 9-58
- **Maximum Diameter:** 1.188 inches
- **Maximum Seated Height:** 2.000 inches
- **Maximum Overall Height:** 2.375 inches
- **Mounting Position:** Any

Pin Connections (12BT Basing)

The tube uses a 12-pin button base (E12-70). Viewed from the underside, the pin connections are assigned as follows:

Pin Number	Connection	Description
1	<u>1G1</u>	Grid No. 1 (Control Grid), Gated-Beam Section
2	1G2	Grid No. 2 (Accelerator), Gated-Beam Section
3	<u>1G3</u>	Grid No. 3 (Suppressor Grid), Gated-Beam Section
4	1K, IS	Cathode and Internal Shield, Gated-Beam Section
5	1P	Plate, Gated-Beam Section
6	2G2	Grid No. 2 (Screen Grid), Pentode Section
7	2G1	Grid No. 1 (Control Grid), Pentode Section
8	2K, IS	Cathode and Internal Shield, Pentode Section
9	2P	Plate, Pentode Section
10	NC	No Connection
11	H	Heater
12	H	Heater

Direct Interelectrode Capacitances

The internal shielding and electrode geometry of the 10Z10 minimize capacitive coupling between the two independent sections. The capacitances are specified without an external shield:

Gated-Beam Discriminator Section (Section 1)

- **Grid No. 1 to Grid No. 3:** 0.009 pF
- **Grid No. 1 to All** (*Cathode, Heater, Grid No. 2, Grid No. 3, Plate, and Internal Shield*): 4.4 pF
- **Grid No. 3 to All** (*Cathode, Heater, Grid No. 1, Grid No. 2, Plate, and Internal Shield*): 3.2 pF

Pentode Section (Section 2)

- **Grid No. 1 to Plate:** 0.22 pF
- **Input** (*Grid No. 1 to Cathode, Heater, Grid No. 2, and Grid No. 3*): 11 pF
- **Output** (*Plate to Cathode, Heater, Grid No. 2, and Grid No. 3*): 7.5 pF

Gated-Beam Discriminator (Section 1)

The gated-beam discriminator section is designed to operate as a combined limiter and discriminator in FM and television sound systems. It features high sensitivity and excellent AM rejection capabilities.

Maximum Ratings (Design-Maximum Values)

- **Plate Supply Voltage:** 330 V
- **Grid-No. 2 (Accelerator) Voltage:** 330 V
- **Grid-No. 1 Voltage, Peak Positive Value:** 60 V
- **Average Cathode Current:** 13 mA

Characteristics and Typical Operation

The gated-beam section can be operated under different circuit configurations depending on whether the accelerator (Grid No. 2) is fed from a direct voltage source or through a series dropping resistor.

Parameter	Direct Voltage	Series Resistor (Option 1)	Series Resistor (Option 2)
Plate Voltage	135 V	135 V	135 V
Grid-No. 3 (Suppressor) Voltage	4 V	4 V	0 V
Grid-No. 2 Supply Voltage	—	280 V	280 V
Grid-No. 2 (Accelerator) Voltage	75 V	—	—
Grid-No. 1 (Control Grid) Voltage	0 V	0 V	0 V
Grid-No. 2 Resistor	—	33 k	33 k
Average Plate Current	—	5.0 mA	—
Grid-No. 2 Current	4.5 mA	—	—

Parameter	Direct Voltage	Series Resistor (Option 1)	Series Resistor (Option 2)
Grid-No. 1 Transconductance to Plate	—	—	360 μ mhos
Grid-No. 3 Transconductance to Plate	—	—	700 μ mhos
Grid-No. 1 Cutoff Voltage (at $I_b = 20$ μ A)	—	—	-4 V (approx.)
Grid-No. 3 Cutoff Voltage (at $I_b = 20$ μ A)	—	—	-4 V (approx.)

Pentode Section (Section 2)

The pentode section of the 10Z10 is a beam power unit designed for Class A1 audio power amplification, capable of delivering sufficient output power to drive a loudspeaker directly.

Maximum Ratings (Design-Maximum Values)

- **Plate Voltage:** 275 V
- **Grid-No. 2 (Screen-Grid) Voltage:** 275 V
- **Plate Dissipation:** 10 W
- **Grid-No. 2 Input (Screen Dissipation):** 2.0 W

Maximum Circuit Values

- **Grid-No. 1 Circuit Resistance (Fixed Bias):** 0.25 $M\Omega$
- **Grid-No. 1 Circuit Resistance (Cathode Bias):** 0.5 $M\Omega$

Typical Class A1 Operating Conditions and Performance

At a typical operating point of 250 V on both the plate and screen grid, the pentode section exhibits the following characteristics:

Parameter	Value
Plate Voltage	250 V
Grid-No. 2 (Screen-Grid) Voltage	250 V

Parameter	Value
Grid-No. 1 (Control-Grid) Voltage	-8.0 V
Peak AF Grid-No. 1 Voltage	8.0 V
Zero-Signal Plate Current	35 mA
Maximum-Signal Plate Current	39 mA
Zero-Signal Grid-No. 2 Current	3.0 mA
Maximum-Signal Grid-No. 2 Current	13 mA
Plate Resistance (Approx.)	0.1 M (100,000..)
Transconductance	6500 μ mhos
Load Resistance	5000..
Total Harmonic Distortion (Approx.)	8.5%
Maximum-Signal Power Output	4.2 W

Technical Summary

The **10Z10** is a versatile **compactron double-unit tube** combining a **gated-beam discriminator** and a **beam power pentode** in a single T-9 glass envelope. Operating with a **10.0 V, 0.6 A heater**, it is designed for space-saving and cost-effective implementation in FM and television receiver audio stages.

The gated-beam section provides efficient limiting and FM demodulation with a plate supply rating of up to **330 V**, while the power pentode section delivers up to **4.2 W** of audio output power under typical Class A1 conditions with a plate dissipation limit of **10 W**. By integrating these two distinct functions, the 10Z10 simplifies receiver circuitry while maintaining high performance.

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 · Pentode

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Grid No.3	0.009 pF	—
Grid No.1 to other electrodes	4.4 pF	—
Grid No.3 to other electrodes	3.2 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	135 V	LimiterDiscriminator
Grid No.3 voltage	4 V	LimiterDiscriminator
Transconductance grid No.1 to plate	360 uS	LimiterDiscriminator
Transconductance grid No.3 to plate	700 uS	LimiterDiscriminator

1975 RCA RC30

Section 2 · Beam Power

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Plate	0.22 pF	—
Grid No.1 to other electrodes	11 pF	—
Plate to other electrodes	7.5 pF	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Screen-grid voltage	250 V	ClassA
Control-grid voltage	-8 V	ClassA
Zero-signal plate current	35 mA	ClassA
Maximum-signal plate current	39 mA	ClassA
Load resistance	5000 ohm	ClassA

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes,
and their source documents.

[Catalog](#) [Tube types](#) [Full books](#) [Blog](#) [Feedback & corrections](#)

© 2026 Tube Tinker