

ELECTRONIC TUBE REFERENCE

12CR6

Voltage Radio Detector Converter electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

DIODE-PENTODE

Combination diode-pentode for receiving-equipment detection and signal amplification. The diode provides detector or rectifying action while the pentode supplies useful voltage gain in series-heater receiver designs.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Diode
No fixed ratings recorded. Promoted values are limited to values explicitly present in this supplied 12-V datasheet block; additional published values are retained in parameter rows.

SECTION2 Pentode	
PLATE RESISTANCE	800000 Ω
TRANSCONDUCTANCE	0.0022 S
MAXIMUM PLATE VOLTAGE	300 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM SCREEN DISSIPATION	0.3 W
Promoted values are limited to values explicitly present in this supplied 12-V datasheet block; additional published values are retained in parameter rows.	

12CR6 — Diode-Remote-Cutoff Pentode

The **12CR6** is a multi-unit miniature vacuum tube containing a single detector diode and a remote cut-off pentode within a single envelope. Sharing a common unipotential cathode, these two distinct electrical systems are housed in a compact 7-pin miniature glass construction. The tube is primarily designed for service in automobile and AC-operated radio receivers, where it functions as a combined AM detector and automatic-volume-controlled (AVC) audio amplifier. By applying the AVC voltage directly to the control grid of the remote cut-off pentode section, overall receiver AVC performance is significantly enhanced.

Construction, Mechanical Specifications, and Pinout

The 12CR6 features an indirectly heated, coated unipotential cathode. The physical structure is enclosed in a T-5-1/2 glass bulb and utilizes a small-button miniature 7-pin base (JETEC No. E7-1). The tube is designed to operate reliably in any mounting position.

Mechanical Dimensions

- **Maximum Overall Length:** 2-1/8 inches
- **Maximum Seated Length:** 1-7/8 inches
- **Length from Base Seat to Bulb Top (excluding tip):** 1-1/2 inches ± 3/32 inch
- **Maximum Diameter:** 3/4 inch

Pin Connection Diagram (7EA Basing)

The 7EA basing arrangement provides the following connections, viewed from the bottom of the tube:

Pin Number	Electrode Connection
Pin 1	Cathode, Pentode Grid No. 3 (Suppressor Grid)
Pin 2	Diode Plate
Pin 3	Heater

Pin Number	Electrode Connection
Pin 4	Heater
Pin 5	Pentode Plate
Pin 6	Pentode Grid No. 2 (Screen Grid)
Pin 7	Pentode Grid No. 1 (Control Grid)

Heater Characteristics

The heater is designed for operation on either AC or DC power.

- **Nominal Heater Voltage:** 12.6 V
- **Nominal Heater Current:** 0.15 A
- **Calculated Heater Power:** 1.89 W (calculated as 12.6 V * 0.15 A)

Pentode Unit Electrical Characteristics and Operating Points

The pentode section of the 12CR6 is characterized by its remote cut-off (super-control) characteristic, which allows it to handle a wide range of input signals without severe distortion when AVC bias is applied. Under typical Class A1 amplifier operating conditions, the pentode unit exhibits the following parameters:

- **Plate Voltage:** 250 V
- **Grid No. 2 (Screen-Grid) Voltage:** 100 V
- **Grid No. 1 (Control-Grid) Voltage:** -2 V
- **Plate Current:** 9.6 mA
- **Grid No. 2 Current:** 2.6 mA
- **Transconductance:** 2200 μ mhos
- **Plate Resistance (Approximate):** 0.8 M Ω
- **Grid No. 1 Voltage for transconductance of 10 μ mhos (Approximate):** -32 V

The very low transconductance of 10 μ mhos at a grid bias of -32 V demonstrates the remote cut-off nature of the control grid, allowing the stage gain to be reduced smoothly over a wide range of negative bias voltages.

Maximum Ratings and Circuit Constraints

The maximum ratings for the 12CR6 are established under the Design-Center System. These limits must not be exceeded under the worst-case operating conditions to ensure device longevity and reliable performance.

Pentode Unit Ratings

- **Maximum Plate Voltage:** 300 V
- **Maximum Grid No. 2 (Screen-Grid) Supply Voltage:** 300 V
- **Maximum Grid No. 2 Voltage:** 150 V (for grid No. 2 voltages up to 150 V, the maximum input is restricted; for voltages between 150 V and 300 V, reference must be made to specific input rating charts)
- **Maximum Positive DC Grid No. 1 Voltage:** 0 V
- **Maximum Plate Dissipation:** 2.5 W
- **Maximum Grid No. 2 Input:** 0.3 W (for grid No. 2 voltages up to 150 V)
- **Maximum Grid No. 1 Circuit Resistance:**
 - *For cathode-bias operation:* 1.0 M
 - *For fixed-bias operation:* 0.25 M

Diode Unit Ratings

- **Maximum Diode Plate Current:** 1.0 mA

Heater-Cathode Ratings

- **Maximum Peak Heater-Cathode Voltage:**
 - *Heater negative with respect to cathode:* 100 V
 - *Heater positive with respect to cathode:* 100 V

Diode Unit Characteristics

The diode unit of the 12CR6 is independent of the pentode unit except for the shared cathode connection. It is designed specifically for low-current detection duties, such as AM demodulation.

- **Minimum Diode Current:** 2 mA (with 10 V DC applied directly to the diode plate)
- **Operation:** The average plate characteristic of the diode unit shows a non-linear rectification curve. At low DC plate voltages, current starts near zero and rises gradually, reaching approximately 2 mA at 10 V DC, and continuing to rise to over 10 mA as the applied DC potential approaches 30 V. The maximum continuous diode plate current rating of 1.0 mA must be respected in practical detector circuit designs.

Characteristic Curves and Interpretation

The behavior of the 12CR6 is further illustrated by its average characteristic curves:

- **Plate Characteristics (Pentode Unit):** At a constant screen-grid (Grid No. 2) potential of 100 V, the plate current curves show typical pentode behavior. Above a plate voltage of approximately 50 V, the plate current curves flatten out, indicating very high plate resistance (nominally 0.8 M). The spacing between the curves for equal steps of Grid No. 1 voltage (from 0 V down to -15 V and beyond) decreases progressively, which is the hallmark of a remote cut-off grid structure.

- **Transfer Characteristics:** Plotting plate current and transconductance against Grid No. 1 voltage reveals a smooth, gradual decline in transconductance from its peak of 2200 μmhos at -2 V bias down to a negligible 10 μmhos at -32 V. This wide grid-bias range prevents cross-modulation and distortion when strong AVC signals are present.

Related Designations

The **12CR6** is closely related to the **6CR6** in its internal structure, application, and electrical characteristics, differing primarily in its heater rating. While the 12CR6 requires a 12.6 V, 0.15 A heater supply, the **6CR6** is designed for a 6.3 V heater supply. These two types are not directly interchangeable without modifying the heater supply circuit.

Technical Summary

The **12CR6** is a versatile 7-pin miniature glass tube combining a single AM detector diode and a remote cut-off pentode with a common unipotential cathode. Operating with a 12.6 V, 0.15 A heater, it is optimized for automobile and AC-operated radio receivers. The pentode section provides a transconductance of 2200 μmhos and a high plate resistance of 0.8 M Ω under typical Class A1 conditions, with a remote cut-off characteristic extending to -32 V for effective AVC operation. The diode unit provides reliable detection with a maximum rated current of 1.0 mA.



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 · Diode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal



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 · Diode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Minimum diode current at 10 V applied	2 mA	DiodeSection

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum heater-cathode voltage	100 V	WholeTube

1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA1
Screen voltage	200 V	ClassA1
Grid 1 voltage	-2 V	ClassA1
Plate current	9.6 mA	ClassA1
Screen current	2.6 mA	ClassA1

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid 1 voltage for 10 μ S transconductance	-12 V	ClassA1



SOURCE DATA APPENDIX

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

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Voltage	12.6 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current	150 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 2 -Diode	2	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Pin 3 -Heater	3	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 4 -Heater	4	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
For grid-No.2 voltages between 150	150 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
and 300 volts	300 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate 4oltage – published value 1	4 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate 4oltage – published value 2	250 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.-2 Voltage – published value 1	2 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.-2 Voltage – published value 2	100 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid-No.1 Voltage	-2 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Plate Resistance (Approx.)	0.8 Mohm	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Transconductance	2200	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Current	9.6 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Current	2.6 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID-NQ2 VOLTS=100	100 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID-N42 VOLTS=100 – published value 1	100 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID-N42 VOLTS=100 – published value 2	2600 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater voltage	12.6 V	Nominal heater rating
Heater current	150 mA	Nominal heater rating

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PLATE VOLTAGE	300 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Positive bias value	0 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
PLATE DISSIPATION	2.5 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
For grid-No.2 voltages up to 150 volts – published value 1	150 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
For grid-No.2 voltages up to 150 volts – published value 2	0.3 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater negative with respect to cathode	100 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Heater positive with respect to cathode	100 V	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
cathode-bias operation	1 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
fixed-bias operation – published value 1	0 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
fixed-bias operation – published value 2	25 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
CURRENT	1 mA	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

1971 RCA HB3 BINDER 5 OF 7

Section 2 · Pentode

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Pin 1 -Cathode, – published value 1	1	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Pin 1 -Cathode, – published value 2	5	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.
Grid No.3	6	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate	7	Published value from the filename-designated RCA datasheet block; multiple numbers on one row represent separate limits or heater arrangements.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum screen-grid input	0.3 W	PublishedOn12VSheet