



ELECTRONIC TUBE REFERENCE

13CW4

Nuvistor Tubes (all numbers) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

TRIODE

High-mu Nuvistor triode used as a grounded-cathode neutralized VHF RF amplifier in television and FM tuners.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12AQ	BASE PINS	4
NOMINAL HEATER	13.5 V / 60 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
PLATE RESISTANCE	5200 Ω
TRANSCONDUCTANCE	0.0125 S
AMPLIFICATION FACTOR	65
MAXIMUM PLATE VOLTAGE	110 V
MAXIMUM PLATE DISSIPATION	1.8 W
MAXIMUM CATHODE CURRENT	15 mA
<i>high-mu Nuvistor</i>	

13CW4 — High-Mu Nuvistor VHF RF Amplifier Triode

An indirectly heated, compact metal-shell high-mu triode intended for neutralized grounded-cathode radio-frequency amplification in VHF television and FM tuners.

Overview

The **13CW4** is a **high-amplification-factor Nuvistor triode** intended for radio-frequency amplifier service in the VHF tuners of color and black-and-white television receivers and FM receivers. RCA explicitly specifies its use as a **grounded-cathode, neutralized RF amplifier**. It is electrically equivalent to the [6CW4](#) and [2CW4](#) Nuvistor types except for the heater rating.

The principal distinction of the 13CW4 is its **13.5 V, 0.060 A heater**, compared with **6.3 V / 0.135 A** for the [6CW4](#) and **2.1 V / 0.45 A** for the [2CW4](#). The tube's compact Nuvistor construction, relatively high transconductance, and published low interelectrode capacitances suit the high-frequency front-end role described in the RCA manuals.

Nuvistor Construction and Heater

The 13CW4 requires a **Nuvistor socket**, rather than a conventional miniature nine-pin or octal socket. RCA describes a metal-shell Nuvistor form and provides a dedicated basing diagram. Its principal electrical construction is a single triode: cathode, control grid, and plate.

Heater characteristic	Value
Heater voltage	13.5 V
Heater current	0.060 A (60 mA)
Calculated heater power	0.81 W
Heater supply	AC or DC
Maximum peak heater-to-cathode voltage	±100 V

The low heater current distinguishes this member of the CW4 family. It must not be treated as interchangeable on an unchanged heater supply with the [2CW4](#) or [6CW4](#), even though RCA identifies the three as having corresponding signal-electrode characteristics.

Intended VHF and FM Applications

The RCA documentation specifies the 13CW4 for **grounded-cathode, neutralized RF amplifier** operation in television and FM tuner circuits. In grounded-cathode service the incoming RF signal is applied to the grid relative to the cathode, and the amplified signal is taken from the plate circuit.

Neutralization is significant because the grid-to-plate capacitance permits some electrical coupling between output and input. A neutralized amplifier arrangement is intended to counter unwanted feedback associated with that coupling, helping maintain stable operation in the VHF tuner application. The precise neutralizing circuit and frequency response depend on the receiver design and are not specified as universal values in the summarized RCA operating tables.

The stated applications include both **color television** and **black-and-white television**, as well as **FM broadcast receivers**. The manufacturer presents the device as a receiving-equipment RF amplifier, not as an audio output or power-transmitting triode.

Maximum Ratings

RCA gives the following **Class A1 amplifier design-maximum ratings**:

Parameter	Rating
Maximum plate voltage	135 V
Maximum plate supply voltage	300 V , subject to plate-resistor condition
Maximum negative grid-bias voltage	55 V
Maximum peak positive grid voltage	0 V
Maximum cathode current	15 mA
Maximum plate dissipation	1.5 W
Maximum grid-circuit resistance, fixed bias	0.5 MΩ
Maximum grid-circuit resistance, cathode bias	2.2 MΩ

The **300 V plate-supply figure is conditional**. RCA permits this supply voltage only where a sufficiently large series plate-circuit resistance ensures that **1.5 W plate dissipation is never exceeded**. It must not be confused with a 300 V maximum operating plate voltage.

The published ratings apply at metal-shell temperatures up to **135°C**. This temperature condition matters because the Nuvistor's metal envelope is part of its compact mechanical construction.

Electrical Characteristics and Operating Conditions

The RCA sheets provide two representative columns, one for typical characteristics and one for typical operation:

Characteristic	Typical characteristics	Typical operation
Plate supply voltage	110 V	70 V
Grid supply voltage	0 V	0 V
Cathode-bias resistor	130 Ω	—
Grid resistor	—	47 k Ω
Amplification factor, μ	65	68
Plate resistance	6,600 Ω	5,440 Ω
Transconductance	9,800 μmhos	12,500 μmhos
Plate current	7.0 mA	7.2 mA

The amplification factor of approximately **65-68** places the 13CW4 in the high-mu triode category. Its transconductance, approximately **9.8-12.5 mA/V** at the published points, is comparatively high for a receiving triode.

The familiar small-signal triode relationship $\mu \approx g_m \times r_p$ is consistent with the tables: $0.0098 \text{ S} \times 6,600 \text{ }\Omega \approx 65$, and $0.0125 \text{ S} \times 5,440 \text{ }\Omega \approx 68$.

RCA also gives an approximate **-4 V grid voltage** for a plate current of **10 μ A** under its specified characteristic condition. This is a useful indication of the grid-bias region associated with near-cutoff current, not a universal cutoff value independent of plate voltage.

Direct Interelectrode Capacitances

The RCA receiving-tube data give approximate capacitances:

Measurement	Capacitance
Grid to plate	0.92 pF
Grid to cathode, heater, and shell	4.3 pF
Plate to cathode, heater, and shell	1.8 pF
Plate to cathode	0.18 pF
Heater to cathode	1.6 pF

These figures are relevant to the input and output tuning of a VHF RF amplifier and to unwanted coupling between grid and plate. In particular, the grid-to-plate capacitance explains the manufacturer's explicit reference to **neutralized** amplifier service.

The grouped capacitance definitions should be retained when comparing them with measurements that isolate only two electrodes.

Related CW4 Heater Variants

Type	Heater voltage	Heater current
2CW4	2.1 V	0.45 A
6CW4	6.3 V	0.135 A
13CW4	13.5 V	0.060 A

RCA describes these as corresponding Nuvistor high-mu RF amplifier triodes, with heater ratings being the distinguishing specification. Their different heater requirements must be respected in receiver maintenance or replacement.

Technical Summary

The **13CW4** is a **13.5 V / 60 mA high-mu Nuvistor triode** for **grounded-cathode, neutralized VHF RF amplification** in **FM receivers** and **color or monochrome television tuners**. It offers an amplification factor of approximately **65-68**, transconductance of approximately **9,800-12,500 μ mhos**, plate resistance of approximately **5.44-6.6 k Ω** , and **1.5 W maximum plate dissipation**.

Its compact metal-shell Nuvistor form, low heater current, published interelectrode capacitances, and specialized VHF tuner application distinguish it from general-purpose audio triodes. The [2CW4](#) and [6CW4](#) are closely related electrical versions with different heater ratings.



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

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Plate Voltage	110 V	Inherited from explicitly referenced 6CW4 parent except heater data.
Plate Dissipation	1.8 W	Inherited from explicitly referenced 6CW4 parent except heater data.
Typical Plate Voltage	70 V	Inherited from explicitly referenced 6CW4 parent except heater data.

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Amplification Factor	65	Inherited from explicitly referenced 6CW4 parent except heater data.
Plate Resistance	5200 Ω	Inherited from explicitly referenced 6CW4 parent except heater data.
Transconductance	12500 μS	Inherited from explicitly referenced 6CW4 parent except heater data.



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 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warm-up Time (Average)	8 s	Other
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue1
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue2
Peak Heater-Cathode Voltage	100 V	Other;PublishedValue3
Plate Supply Voltage	300 V	MaximumRating
Plate Voltage	135 V	MaximumRating
Negative-bias value	55 V	MaximumRating
Peak positive value	0 V	MaximumRating
Cathode Current	15 mA	MaximumRating
Plate Dissipation	1.5 W	MaximumRating
Plate Supply Voltage	110 V	TypicalOperation;PublishedValue1
Plate Supply Voltage	70 V	TypicalOperation;PublishedValue2
Cathode-Bias Resistor	130 V	TypicalOperation;PublishedValue1
Cathode-Bias Resistor	0 V	TypicalOperation;PublishedValue2
Grid Resistor –	4 ohm	TypicalOperation;PublishedValue1
Grid Resistor –	0 ohm	TypicalOperation;PublishedValue2
Plate Resistance (Approx.)	6600 ohm	TypicalOperation;PublishedValue1
Plate Resistance (Approx.)	5440 ohm	TypicalOperation;PublishedValue2
Plate Current	7 mA	TypicalOperation;PublishedValue1
Plate Current	7.2 mA	TypicalOperation;PublishedValue2
Grid Voltage (Approx,) for plate current of	10 V	TypicalOperation;PublishedValue1
Grid Voltage (Approx,) for plate current of	-4 V	TypicalOperation;PublishedValue2
For fixed-bias operation	0.5 megohm	MaximumCircuitValue
For cathode-bias operation	2.2 megohm	MaximumCircuitValue
* A plate supply voltage of	300 V	MaximumCircuitValue
in the plate circuit to limit the plate dissipation to	1.5 W	MaximumCircuitValue
PLATE	92 V	MaximumCircuitValue;PublishedValue1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PLATE	524 V	MaximumCircuitValue;PublishedValue2
Maximum Plate Voltage	135 V	Section1
Maximum Plate Dissipation	1.5 W	Section1
Maximum Cathode Current	15 mA	Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	0.92 pF	Capacitance
Grid to Cathode. Heater, and Shell	4.3 pF	Capacitance
Plate to Cathode, Heater, and Shell	1.8 pF	Capacitance
Plate to Cathode	0.18 pF	Capacitance
Heater to Cathode	1.6 pF	Capacitance

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Resistance	6600 ohm	Section1
Transconductance	9800 uS	Section1
Amplification Factor	65	Section1

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