

ELECTRONIC TUBE REFERENCE

17CU5

Power - Beam Single (NOT sweep) (under 10W) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
BEAMPOWER

Miniature beam-power tube used in television-receiver audio-output stages, electrically related to the 6CU5 apart from heater characteristics.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7CV	BASE PINS	7
NOMINAL HEATER	16.8 V / 450 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7CV - TERMINAL PINOUT

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

SECTION RATINGS

SECTION1 Beam Power	
PLATE RESISTANCE	10000 Ω
TRANSCONDUCTANCE	0.0075 S
MAXIMUM PLATE VOLTAGE	135 V
MAXIMUM SCREEN VOLTAGE	117 V
MAXIMUM PLATE DISSIPATION	6 W
MAXIMUM SCREEN DISSIPATION	1.25 W
<i>Reference/equivalence-only source does not reproduce the referenced electrical ratings/characteristics; promoted values intentionally not inferred from external datasheets.</i>	

17CU5 — Beam Power Pentode

The **17CU5** (also designated as **17CU5/17C5**) is a miniature 7-pin beam power pentode designed primarily for audio power amplifier service. It is widely utilized in the audio output stages of television receivers (including color television sets) as well as AM and FM radio receivers. The tube is engineered to deliver high power sensitivity and high plate efficiency while operating at relatively low plate and screen-grid voltages.

Overview and Related Designations

The 17CU5 is electrically identical to the **6CU5** and **12CU5/12C5** vacuum tubes, differing only in its heater ratings and characteristics. It features a compact physical design and is optimized for series-connected heater strings, incorporating controlled warm-up characteristics to minimize voltage surges during receiver start-up.

Mechanical Construction, Base, and Pinout

The 17CU5 is constructed in a T-5 1/2 glass envelope with a miniature Button 7-Pin base (JETEC E7-1, outline 5-3). The tube can be mounted and operated in any position.

Physical Dimensions

- **Maximum Diameter:** 0.750 inches
- **Maximum Seated Height:** 2.375 inches
- **Maximum Overall Height:** 2.625 inches

Pin Connections (7CV Basing)

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

Pin Number	Electrode Connection
Pin 1	Grid No. 1 (Control Grid)
Pin 2	Cathode & Grid No. 3 (Beam Plates)
Pin 3	Heater
Pin 4	Heater
Pin 5	Grid No. 1 (Control Grid)
Pin 6	Grid No. 2 (Screen Grid)
Pin 7	Plate

Note: Grid No. 1 is internally connected to both Pin 1 and Pin 5.

Heater and Cathode Characteristics

The tube utilizes a coated unipotential cathode. The heater is designed for series string operation with a controlled warm-up time.

- **Heater Voltage (AC or DC):** 16.8 V
- **Heater Current:** 0.45 A (with a tolerance of $\pm 6\%$ or ± 0.030 A)
- **Heater Warm-up Time (Average):** 11 seconds
- **Heater Power (Calculated):** Using the nominal voltage of 16.8 V and nominal current of 0.45 A, the calculated heater power consumption is $16.8 \text{ V} * 0.45 \text{ A} = 7.56 \text{ W}$.

The heater warm-up time is defined as the time required for the heater voltage to reach 80% of its rated value when four times the rated heater voltage (67.2 V) is applied to the heater in series with an external resistance equal to three times the rated voltage divided by the rated current.

Heater-Cathode Voltage Limits

To prevent insulation breakdown, the voltage difference between the heater and the cathode must be kept within the following limits:

- **Heater Negative with Respect to Cathode:** 200 V maximum (Total DC + Peak)
- **Heater Positive with Respect to Cathode:**
 - **DC Component:** 100 V maximum
 - **Total DC + Peak:** 200 V maximum

Direct Interelectrode Capacitances

The approximate direct interelectrode capacitances of the 17CU5, measured without an external shield, are:

- **Grid No. 1 to Plate:** 0.6 pF
- **Input (Grid No. 1 to Cathode, Heater, Grid No. 2, and Grid No. 3):** 13 pF
- **Output (Plate to Cathode, Heater, Grid No. 2, and Grid No. 3):** 8.5 pF

Maximum Ratings and Circuit Values

The maximum ratings of the 17CU5 are published under both the Design-Maximum and Design-Center rating systems. These values represent limits that should not be exceeded under the worst-case operating conditions.

Parameter	Design-Maximum Values	Design-Center Values
Plate Voltage	150 V	135 V
Grid No. 2 (Screen-Grid) Voltage	130 V	117 V
Plate Dissipation	7.0 W	6.0 W
Grid No. 2 Input / Dissipation	1.4 W	1.25 W
Positive Grid No. 1 Voltage	0 V	0 V
Bulb Temperature (at hottest point)	220 °C	220 °C

Operating Environment and Thermal Considerations

At the maximum bulb temperature of 220 °C, high ambient temperatures or restrictive physical shielding may require a reduction in operating dissipation to prevent thermal runaway or envelope damage. If shields are used, they should be ventilated and painted dull black on both the interior and exterior surfaces to maximize heat radiation.

Maximum Grid No. 1 Circuit Resistance

To maintain bias stability, the resistance in the control grid circuit must not exceed the following limits:

- **For Fixed-Bias Operation:** 0.1 MΩ
- **For Cathode-Bias Operation:** 0.5 MΩ

Typical Operation and Electrical Characteristics

In typical Class A1 audio frequency power amplifier service, the 17CU5 operates under the following nominal conditions:

- **Plate Voltage:** 120 V
- **Grid No. 2 Voltage:** 110 V
- **Grid No. 1 Voltage:** -8.0 V

- **Peak AF Grid No. 1 Voltage:** 8.0 V
- **Zero-Signal Plate Current:** 49 mA
- **Maximum-Signal Plate Current:** 50 mA
- **Zero-Signal Grid No. 2 Current:** 4.0 mA
- **Maximum-Signal Grid No. 2 Current:** 8.5 mA
- **Plate Resistance (Approximate):** 10,000 Ω
- **Transconductance:** 7,500 μmhos
- **Load Resistance:** 2,500 Ω
- **Total Harmonic Distortion (Approximate):** 10%
- **Maximum-Signal Power Output:** 2.3 W

Curve Observations and Alternative Operating Points

Average Plate Characteristics

When operating with a screen-grid (Grid No. 2) voltage of 110 V, the plate current curves display a typical pentode knee occurring between 20 V and 40 V. At a control grid bias (E_{c1}) of 0 V, the plate current peaks near 135 mA. Under this same 0 V bias condition, the screen-grid current (I_{c2}) drops significantly as plate voltage increases, falling from approximately 50 mA at low plate potentials to about 15 mA at a plate voltage of 250 V.

Alternative Operating Conditions

Under an alternative operating point with the plate and screen-grid both set to 110 V, a control grid bias of -7.5 V, and an RMS signal input of 5.3 V, the performance varies as follows:

- **Power Output:** Peaks at approximately 1.9 W when using a load resistance of 2,200 Ω .
- **Total Harmonic Distortion:** Reaches a minimum of approximately 4.5% at a 2,200 Ω load, but rises sharply if the load resistance is increased or decreased from this value.
- **Current Variations:** As the load resistance is increased, the plate current decreases while the screen-grid current increases.

Technical Summary

The 17CU5 is a high-sensitivity, high-efficiency miniature beam power pentode designed for low-voltage audio output stages in television and radio receivers. Operating with a 16.8 V, 450 mA heater, it is well-suited for series-string heater configurations. With a maximum plate dissipation of 7.0 W (Design-Maximum) and a typical Class A1 power output of 2.3 W at 120 V plate voltage, the 17CU5 provides robust audio performance in a compact 7-pin package.



SOURCE OPERATING CONDITIONS

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	120 V	ClassA
Plate current	49 mA	ClassA

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	10000 Ohm	—
Transconductance	7500 uS	—



SOURCE OPERATING CONDITIONS

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Warmup Time	11 s	—



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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	16.8 V	AC or DC at rated heater current
Heater current	450 mA	Nominal current
Warm-up time	11 s	Average
Reference parent type	6CU5	Electrical characteristics same except heater



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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater Voltage (ac/dc) 6.3 12.6	16.8 V	Published in approved 17CU5 target datasheet entry; Section1
Heater Current 1.2 0.6	450 mA	Published in approved 17CU5 target datasheet entry; Section1
Heater Warm-up Time (Average) 11	11 seconds	Published in approved 17CU5 target datasheet entry; Section1
Plate Voltage	150 V	Published in approved 17CU5 target datasheet entry; Section1
Grid-No.2 (Screen-Grid) Voltage	130 V	Published in approved 17CU5 target datasheet entry; Section1
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0 V	Published in approved 17CU5 target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate Dissipation	7 W	Published in approved 17CU5 target datasheet entry; Section1
Grid-No.2 Input	1.4 W	Published in approved 17CU5 target datasheet entry; Section1
Plate Voltage	120 V	Published in approved 17CU5 target datasheet entry; Section1
Grid-No.2 Voltage	110 V	Published in approved 17CU5 target datasheet entry; Section1
Grid-No.1 Voltage	-8 V	Published in approved 17CU5 target datasheet entry; Section1
Peak AF Grid-No.1 Voltage	8 V	Published in approved 17CU5 target datasheet entry; Section1
Zero-Signal Plate Current	49 mA	Published in approved 17CU5 target datasheet entry; Section1
Zero-Signal Grid-No.2 Current	4 mA	Published in approved 17CU5 target datasheet entry; Section1
Maximum-Signal Grid-No.2 Current	8.5 mA	Published in approved 17CU5 target datasheet entry; Section1
Plate Resistance (Approx.)	10000 Ω	Published in approved 17CU5 target datasheet entry; Section1
Transconductance	7500 μS	Published in approved 17CU5 target datasheet entry; Section1
Load Resistance	2500 Ω	Published in approved 17CU5 target datasheet entry; Section1
Total Harmonic Distortion	10 %	Published in approved 17CU5 target datasheet entry; Section1
Maximum-Signal Power Output	2.3 W	Published in approved 17CU5 target datasheet entry; Section1
For fixed-bias operation	0.1 MΩ	Published in approved 17CU5 target datasheet entry; Section1
For cathode-bias operation	0.5 MΩ	Published in approved 17CU5 target datasheet entry; Section1
Heater Voltage (ac/dc) 2.1 6.3	13.5 V	Published in approved 17CU5 target datasheet entry; Section1
Heater Current 0.45 0.135	60 mA	Published in approved 17CU5 target datasheet entry; Section1
Plate Voltage	135 V	Published in approved 17CU5 target datasheet entry; Section1
Negative-bias value	55 V	Published in approved 17CU5 target datasheet entry; Section1

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak positive value	0 V	Published in approved 17CU5 target datasheet entry; Section1
Cathode Current	15 mA	Published in approved 17CU5 target datasheet entry; Section1
Plate Dissipation	1.5 W	Published in approved 17CU5 target datasheet entry; Section1

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1 to Plate	0.6 pF	Published in approved 17CU5 target datasheet entry; Section1
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	13 pF	Published in approved 17CU5 target datasheet entry; Section1
Plate to Cathode, Heater, Grid No.2, and Grid No.3	8.5 pF	Published in approved 17CU5 target datasheet entry; Section1
Grid to Plate	0.92 pF	Published in approved 17CU5 target datasheet entry; Section1
Grid to Cathode. Heater, and Shell	4.3 pF	Published in approved 17CU5 target datasheet entry; Section1
Plate to Cathode, Heater, and Shell	1.8 pF	Published in approved 17CU5 target datasheet entry; Section1
Plate to Cathode	0.18 pF	Published in approved 17CU5 target datasheet entry; Section1
Heater to Cathode	1.6 pF	Published in approved 17CU5 target datasheet entry; Section1