

ELECTRONIC TUBE REFERENCE

13CM5

Power - TV Horizontal Output (sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
PENTODE

Output pentode designed specifically for television horizontal-output service, providing the pulse-current and voltage capability required to drive a line-deflection transformer.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	12.8 V / 500 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	5000 Ω
TRANSCONDUCTANCE	0.014 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	11 W
MAXIMUM CATHODE CURRENT	200 mA
Published ratings and characteristics promoted from the supplied Rogers/Rogers Majestic source.	

13CM5 — Television Horizontal Output Pentode

The **13CM5** is an indirectly heated output pentode designed specifically for service as a horizontal output tube in television receivers. Introduced to the Electronic Industries Alliance (EIA) registration process in late 1958 by Rogers Electronic Tubes and Components of Toronto, Ontario, this tube is engineered to handle the high peak voltages and currents characteristic of television horizontal deflection circuits. It

features a T9 glass envelope, an eight-pin octal base, and a top-cap connection for the plate to isolate high-voltage pulses from the other electrodes.

Physical Construction and Pinout

The 13CM5 is constructed in a T9 glass bulb with a maximum body length of 3 3/4 inches and a maximum overall length of 4 5/16 inches. The maximum diameter of the bulb is 1 3/16 inches. It utilizes a B7-59 octal base and a C1-2 miniature top cap.

The top cap is dedicated to the plate (anode) connection, which is a common design practice for horizontal output tubes to prevent arc-over from the high-voltage flyback pulses to the lower-voltage pins on the base.

The base connections, viewed from the bottom, are assigned as follows:

Pin Number	Element
Pin 1	Internal connection
Pin 2	Heater
Pin 3	Internal connection
Pin 4	Grid No. 2 (Screen Grid)
Pin 5	Grid No. 1 (Control Grid)
Pin 7	Heater
Pin 8	Cathode, Grid No. 3 (Suppressor Grid)
Top Cap	Plate (Anode)

Pins 1 and 3 are designated as internal connections and must not be used for external circuit connections. Pin 6 is omitted from the physical pin layout.

Heater Characteristics

The 13CM5 features an indirectly heated cathode. The heater is designed for series or parallel operation with the following nominal ratings:

- **Heater Voltage:** 12.8 V
- **Heater Current:** 500 mA (0.5 A)

Using these nominal values, the heater power consumption can be calculated as follows:

Heater Power = 12.8 V × 0.5 A = 6.4 W

Typical Operating Characteristics

Under typical Class A testing conditions, the 13CM5 exhibits high transconductance and relatively low plate resistance. The typical operating parameters are specified as follows:

- **Plate Voltage:** 100 V
- **Grid No. 2 Voltage:** 100 V
- **Grid No. 1 Bias:** -8.2 V
- **Plate Current:** 100 mA
- **Grid No. 2 Current:** 7 mA
- **Transconductance:** 14,000 μmhos (micromhos)
- **Plate Resistance:** 5,000 Ω
- **Amplification Factor (Grid No. 2 with respect to Grid No. 1):** 5.6

These characteristics demonstrate the tube's ability to deliver high current (100 mA plate current) at a relatively low plate voltage of 100 V, which is essential for efficient horizontal deflection output stages.

Maximum Ratings and Permissible Operating Area

The maximum ratings for the 13CM5 are established under the Design Center system. Circuit designers must ensure these limits are not exceeded under normal operating variations.

Voltage and Current Limits

- **Plate Voltage:** 250 V
- **Plate Voltage (without plate current / cold start):** 550 V
- **Peak Plate Voltage:** 7,000 V
- **Peak Inverse Plate Voltage:** 1,500 V
- **Grid No. 2 Voltage:** 250 V
- **Grid No. 2 Voltage (without current):** 550 V
- **Peak Negative Grid No. 1 Voltage:** 1,000 V
- **Cathode Current:** 200 mA
- **Heater-to-Cathode Voltage (Cathode positive with respect to heater):** 250 V
- **Heater-to-Cathode Voltage (Cathode negative with respect to heater):** 200 V
- **Circuit Resistance between Cathode and Heater:** 20,000 Ω

The peak plate voltage rating of 7,000 V and peak inverse plate voltage of 1,500 V are subject to a strict pulse duration limit: the maximum pulse duration must not exceed 22% of one operating cycle, with an absolute maximum duration of 18 microseconds.

The maximum allowable Grid No. 1 circuit resistance is normally **0.5 M Ω** . However, if the combined total dissipation of the plate (anode) and Grid No. 2 is kept below 10 W, the maximum Grid No. 1 circuit resistance may be increased up to **2.2 M Ω** .

Permissible Dissipation and Operating Area

Unlike tubes with fixed, independent dissipation ratings, the 13CM5 features an interactive relationship between plate dissipation and Grid No. 2 dissipation. The "Area of permissible operation" is defined by a boundary curve:

- **Maximum Grid No. 2 Dissipation:** 5.0 W under normal operating conditions.
- **Maximum Plate Dissipation:** 11.0 W.
- **Interactive Boundary:** For plate dissipation values between 0 W and 8.0 W, the maximum Grid No. 2 dissipation remains constant at 5.0 W. For plate dissipation values exceeding 8.0 W, the maximum allowable Grid No. 2 dissipation decreases linearly from 5.0 W down to 0 W at a plate dissipation of 11.0 W.
- **Transient Exception:** During the warm-up period of the television's booster diode, the maximum permissible Grid No. 2 dissipation is temporarily allowed to rise to a maximum of 7.0 W.

Technical Summary

The **13CM5** is a specialized, high-performance horizontal output pentode featuring a 12.8 V, 500 mA heater, a T9 envelope with a B7-59 octal base, and a C1-2 top cap. It is optimized for television horizontal deflection circuits, where it can safely withstand peak plate pulses up to 7,000 V. With a transconductance of 14,000 μmhos and a peak cathode current rating of 200 mA, it provides the high current capability required for driving deflection yokes. Its design incorporates an interactive dissipation limit between the plate (up to 11.0 W) and Grid No. 2 (up to 5.0 W, or 7.0 W during booster diode warm-up), ensuring reliable operation within its defined permissible area.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1959 Rogers

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

1959 ROGERS

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentVoltage	12.8 V	—
HeaterOrFilamentCurrent	500 mA	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak positive pulse plate voltage	7000 V	peak positive plate pulse max; manufacturer datasheet
Peak negative pulse plate voltage	-1500 V	peak inverse plate pulse; manufacturer datasheet
Plate voltage	100 V	typical plate voltage; manufacturer datasheet
Grid #2 voltage	100 V	typical screen voltage; manufacturer datasheet
Grid #1 voltage	-8.2 V	typical grid bias; manufacturer datasheet
Plate current	100 mA	typical plate current; manufacturer datasheet
Grid #2 current	7 mA	typical grid 2 current; manufacturer datasheet
Peak Heater-Cathode Voltage	250 V	cathode positive relative heater maximum; manufacturer datasheet
Peak Heater-Cathode Voltage	200 V	cathode negative relative heater maximum; manufacturer datasheet