



ELECTRONIC TUBE REFERENCE

13GC8

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

BEAMPOWER-TRIODE

Combination tube containing a triode and beam tetrode for audio-amplifier or television frame time-base service, with the beam section serving as the power-output element.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	13 V / 300 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode	
TRANSCONDUCTANCE	0.014 S
MAXIMUM PLATE VOLTAGE	250 V
<i>Published source ratings and characteristics promoted where applicable; additional data retained as parameters.</i>	

SECTION2 Beam Power	
TRANSCONDUCTANCE	0.0065 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
<i>Published source ratings and characteristics promoted where applicable; additional data retained as parameters.</i>	

13GC8 — Triode-Beam Tetrode Vacuum Tube

The **13GC8** is a multi-section vacuum tube containing a triode and an output beam tetrode within a single envelope. Each section is constructed with its own independent cathode, allowing separate biasing and circuit configurations. The tube is designed primarily for use in the audio amplifier or frame time-base (vertical deflection) stages of television receivers operating with series-connected heater chains on AC/DC mains power supplies.

Construction, Heater, and Physical Specifications

The 13GC8 is housed in a clear T6 1/2 glass bulb with a standard 9-pin Noval (B9A, E9-1) base. The physical layout is compact, designed to fit standard television chassis layouts while providing adequate heat dissipation.

The heater is designed for series-string operation, drawing a constant current. The heater and physical dimensions are characterized by the following parameters:

Parameter	Value
Heater Current (I_h)	0.3 A
Heater Voltage (V_h)	13.0 V
Calculated Heater Power	3.9 W
Bulb Type	Clear T6 1/2
Base Type	Noval (B9A) E9-1
Mounting Position	Unrestricted
Maximum Overall Length	67.5 mm
Maximum Seated Height	60.5 mm
Maximum Diameter	22.2 mm
Approximate Net Weight	3/4 oz
Approximate Packed Weight	1 oz

Pin Connections (9KZ)

The 13GC8 uses the **9KZ** pinout configuration, viewed from the free end of the pins:

Pin Number	Connection	Symbol
1	Triode Anode	a_t
2	Triode Grid	g_t

Pin Number	Connection	Symbol
3	Triode Cathode	k_t
4	Heater	h
5	Heater	h
6	Tetrode Anode	a_q
7	Tetrode Cathode, Beam Plates	$k_q, b.p.$
8	Tetrode Screen Grid	g_2
9	Tetrode Control Grid	g_1

Electrical Characteristics and Maximum Ratings

The maximum ratings of the 13GC8 must be strictly observed to ensure reliable operation and prevent premature failure. The tube features a shared maximum anode dissipation limit that restricts the simultaneous operation of both sections at their individual peak limits.

Rating	Tetrode Section	Triode Section
Maximum Anode Voltage ($V_{a(max)}$)	250 V	250 V
Maximum Screen Voltage ($V_{[g_2] (/tubes/G_2) (max)}$)	250 V	—
Maximum Anode Dissipation ($P_{a(max)}$)	5.5 W*	2.0 W*
Maximum Screen Dissipation (Continuous) ($P_{[g_2] (/tubes/G_2) (max)}$)	1.5 W	—
Maximum Screen Dissipation (Speech & Music)	2.2 W	—
Maximum Heater-to-Cathode Voltage ($V_{h-k(max)}$)	150 V r.m.s.**	150 V r.m.s.**

* **Note on Anode Dissipation:** The total combined anode dissipation of both sections must not exceed 6.0 W. ** **Note on Heater-to-Cathode Voltage:** Measured with respect to the higher potential heater pin.

Section Characteristics

At typical operating points, the individual sections exhibit the following electrical characteristics:

- **Triode Section** (measured at $V_a = 200\text{ V}$, $I_a = 10\text{ mA}$):
 - Amplification Factor (μ): 18
 - Anode Impedance (r_a): $5,300\ \Omega$
 - Mutual Conductance (g_m): 3.4 mA/V
 - *Calculation:* The relationship $\mu \approx g_m \times r_a$ is verified by $0.0034\text{ S} \times 5,300\ \Omega = 18.02$.
- **Tetrode Section** (measured at $V_a = 170\text{ V}$, $V_{[g2]}(/tubes/G2) = 180\text{ V}$, $I_a = 32\text{ mA}$):
 - Mutual Conductance (g_m): 6.5 mA/V

Typical Operating Conditions

Class A Power Output (Tetrode Section)

The tetrode section is optimized for audio power output or vertical deflection drive. Typical Class A operating conditions are specified with fixed DC potentials:

Parameter	Condition A (Low Distortion)	Condition B (High Output)
Anode Supply Voltage ($V_{a(b)}$)	170 V	170 V
Screen Supply Voltage ($V_{[g2]}(/tubes/G2)(b)$)	180 V	180 V
Grid Bias Voltage (V_{g1})	-9.6 V	-9.6 V
Quiescent Anode Current ($I_{a(o)}$)	28 mA	28 mA
Quiescent Screen Current ($I_{[g2]}(/tubes/G2)(o)$)	6.5 mA	6.5 mA
Anode Load (R_a)	$6,000\ \Omega$	$5,300\ \Omega$
Power Output (P_{out})	2.0 W	2.35 W
Input Swing ($V_{in(r.m.s.)}$)	3.3 V	3.9 V
Distortion Limits	3rd & 2nd Harmonic $\leq 5\%$	3rd & 2nd Harmonic $\leq 7\%$

Circuit Constraint: When operating the tetrode section at its maximum wattage rating, the grid-to-cathode circuit resistance must not exceed $0.5\text{ M}\Omega$ when using cathode self-bias.

Frame Time-Base Operation

In vertical deflection (frame time-base) applications, the output stage must be designed to accommodate component tolerances, valve-to-valve variations, and performance degradation over the tube's operating life. The peak anode current capabilities of the tetrode section under specific test conditions ($V_a = 50$ V, $V_{g2}(/tubes/G2) = 180$ V, $V_{g1} = -1$ V) are:

- **Average New Valve:** 96 mA peak anode current.
- **Assumed End-of-Life Condition:** 62 mA peak anode current.

Designing the deflection circuit around the end-of-life peak current ensures stable vertical height and linearity throughout the service life of the tube.

Inter-electrode Capacitances

The inter-electrode capacitances of the 13GC8 are documented under two distinct conditions: with the holder capacitance balanced out (†), and including a standard ceramic B9A unskirted holder without a radial shield (Carr Fastener holder type [77/076](#)) (‡). In both cases, "Earth" refers to the electrodes of the other section and all remaining earthy potential electrodes of the section under measurement, with the heater and shields connected to the cathode.

Section / Measurement	Balanced Holder (†)	Total with B9A Holder (‡)
Triode Section		
Grid to Earth ($C_{in}(t)$)	2.6 pF	3.7 pF
Anode to Earth ($C_{out}(t)$)	2.0 pF	3.0 pF
Anode to Grid ($C_{a(t),g(t)}$)	2.4 pF	2.7 pF
Tetrode Section		
Grid 1 to Earth ($C_{in}(q)$)	9.8 pF	11.0 pF
Anode to Earth ($C_{out}(q)$)	7.3 pF	8.6 pF
Anode to Grid 1 ($C_{a(q),g1(q)}$)	0.21 pF	0.21 pF
Cross-Sectional Capacitances		
Tetrode Anode to Triode Anode ($C_{a(q)-a(t)}$)	1.0 pF	1.0 pF
Tetrode Grid 1 to Triode Grid ($C_{g1(q)-g(t)}$)	0.014 pF	0.016 pF

Section / Measurement	Balanced Holder (†)	Total with B9A Holder (‡)
Tetrode Anode to Triode Grid ($C_{a(q)-g(t)}$)	0.093 pF	0.093 pF
Tetrode Grid 1 to Triode Anode ($C_{g1(q)-a(t)}$)	0.1 pF	0.18 pF

Related Designations and Curves

The triode section of the 13GC8 shares identical electrical characteristics with the triode section of the **30PL1** and the **6/30L2** triode.

The characteristic curves of the tetrode section illustrate the relationship between the control grid voltage (V_{g1}), screen grid voltage ($V_{[g2]}(/tubes/G2)$), and the resulting anode and screen currents. The transfer curves demonstrate that at a screen voltage of 180 V, the anode current falls smoothly as the grid bias is made more negative, reaching cutoff near -35 V. The plate curves show the typical knee characteristic of a beam tetrode, where anode current stabilizes rapidly above an anode voltage of approximately 50 V, minimizing distortion in audio and deflection applications.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1959 Ediswan

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

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Section 1 · Triode

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Audio amplifier / frame time-base triode	—

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Section 2 · Beam Power

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Output beam tetrode	—

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