



ELECTRONIC TUBE REFERENCE

16GK8

Power - Beam (NOT sweep) electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

BEAMPOWER-TRIODE

Combined triode and beam-output tetrode for television service, with the power section rated for high positive anode pulses characteristic of deflection operation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	16 V / 300 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

SECTION RATINGS

SECTION1 Triode

AMPLIFICATION FACTOR	18
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Published source ratings and characteristics promoted where applicable; additional data retained as parameters.

SECTION2 Beam Power

MAXIMUM PLATE VOLTAGE	2000 V
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Published source ratings and characteristics promoted where applicable; additional data retained as parameters.

16GK8 — Triode Output Beam Tetrode

An indirectly heated dual-section valve combining a triode and an output beam tetrode, designed for use in AC/DC mains television receivers as a frame time base.

Overview

The **16GK8** (also designated under the developmental type **30PL13**) is a specialized multi-unit vacuum tube containing a triode and an output beam tetrode within a single envelope. Manufactured by Siemens Edison Swan Limited under the Ediswan Mazda brand, this tube is specifically engineered for frame time base (vertical deflection) applications in AC/DC mains television receivers.

The tube features a series-string heater rated at **16 V** and **0.3 A**, making it suitable for television designs utilizing a shared heater chain. The two independent sections—a voltage-amplifying triode and a power-handling beam tetrode—are housed in a compact glass envelope with a standard nine-pin miniature base.

Physical Construction and Pinout

The 16GK8 is constructed in a **T6 1/2** bulb envelope with a **B9A (Noval)** nine-pin miniature base (also designated as American Base E9-1). The physical dimensions of the tube are compact, allowing for flexible layout configurations:

Dimension	Value
Maximum Overall Length	76.5 mm
Maximum Seated Height	71.5 mm
Maximum Diameter	22.2 mm

The tube is rated for **unrestricted mounting positions**, allowing it to be oriented horizontally or vertically depending on the chassis layout.

The **9JE** basing configuration provides the following pin connections, viewed from the free end of the base:

Pin	Electrode Connection
1	Triode Grid (g_t)
2	Tetrode Cathode, Beam Plates, and Shield (k_q, b_p, s)
3	Tetrode Control Grid (g_1)
4	Heater (h)
5	Heater (h)
6	Tetrode Anode (a_q)
7	Tetrode Screen Grid (g_2)
8	Triode Cathode (k_t)

Pin	Electrode Connection
9	Triode Anode (a_t)

The tetrode section features a combined cathode, beam-forming plates, and internal shielding connected to a single pin (Pin 2), while the triode section has an entirely independent cathode (Pin 8).

Electrical Ratings and Heater Characteristics

The 16GK8 is designed for reliable operation under the demanding conditions of television deflection circuits. The heater is designed for series-string operation:

Heater Parameter	Value
Heater Voltage	16 V
Heater Current	0.3 A
Calculated Heater Power	4.8 W

The maximum ratings for each section are defined as follows:

Parameter	Tetrode Section	Triode Section
Maximum Anode Dissipation	7.0 W	1.0 W
Maximum Screen Dissipation	2.4 W	—
Maximum Anode Voltage	250 V	250 V
Maximum Screen Voltage	250 V	—
Maximum Heater-to-Cathode Voltage	150 V rms	150 V rms
Maximum Mean Cathode Current	75 mA	—
Maximum Grid 1 to Cathode Resistance (Self Bias)	2.0 M Ω	—
Maximum Grid 1 to Cathode Resistance (Fixed Bias)	1.0 M Ω	—

Pulsed Anode Ratings (Tetrode Section)

For frame time base output service, the tetrode section is subject to high-voltage inductive pulses during the retrace interval. The tube is rated to withstand these transient peaks:

- **Maximum Peak Anode Voltage (Pulse Positive):** 2.0 kV

- **Maximum Peak Anode Voltage (Pulse Negative):** 500 V
- These pulse ratings are restricted to a maximum pulse duration of **4% of one cycle**, with an absolute maximum duration of **800 μ s**.
- The heater-to-cathode voltage limit of 150 V rms is measured with respect to the higher potential heater pin.

Triode Section Characteristics

The triode section of the 16GK8 is designed for general-purpose voltage amplification or saw-tooth generation in the frame time base circuit. Its characteristics are identical to those of the **V863B** and **6/30L2** triodes.

At a typical operating point, the triode exhibits the following electrical characteristics:

Parameter	Value
Anode Voltage (V_a)	200 V
Anode Current (I_a)	10 mA
Mutual Conductance (g_m)	3.4 mA/V
Amplification Factor (μ)	18

Using the standard relationship between amplification factor, mutual conductance, and plate resistance ($r_p = \mu/g_m$), the internal plate resistance of the triode section can be calculated:

$$\text{Calculated Plate Resistance } (r_p) = \frac{18}{0.0034 \text{ S}} \approx 5,294 \, \Omega \text{ (or approximately } 5.3 \text{ k}\Omega\text{)}$$

Tetrode Section and Frame Time Base Operation

The beam tetrode section is optimized to deliver high peak currents at low anode voltages, which is essential for efficient vertical deflection output stages.

To ensure reliable circuit performance over the operating life of the television receiver, designers must account for component variations, valve spread, and cathode deterioration. The available peak anode current is specified for both a new valve and an assumed end-of-life condition:

Typical Peak Operating Points

- **Average New Valve:**
 - Anode Voltage (V_a): 55 V
 - Screen Voltage ($V_{[g2]}$ ($/tubes/G2$)): 170 V
 - Control Grid Voltage (V_{g1}): -1 V
 - Anode Current (I_a): 175 mA
- **Assumed End of Life Condition:**

- Anode Voltage (V_a): 50 V
- Screen Voltage ($V_{[g2]}/tubes/G2$): 170 V
- Control Grid Voltage (V_{g1}): -1 V
- Anode Current (I_a): 110 mA

These figures demonstrate that even at the end of its useful life, the tetrode section can deliver a peak current of 110 mA at an anode potential of only 50 V, ensuring adequate deflection amplitude as the tube ages.

Analysis of Characteristic Curves

The published curves provide a detailed graphical representation of the tube's performance across various operating regions.

Tetrode Section Curves

- **Transfer Characteristics ($I_a, I_{[g2]}/tubes/G2$ vs. V_{g1}):** The curves show anode and screen currents plotted against control grid voltage for various combined anode and screen voltages ($V_a = V_{[g2]}/tubes/G2$) from 100 V to 250 V. The anode current rises steeply as the grid bias approaches 0 V, demonstrating high peak current capability. Screen current (represented by dashed lines) remains significantly lower than anode current across the operating range, minimizing screen grid thermal stress.
- **Anode Characteristics (I_a vs. V_a):** At a fixed screen voltage ($V_{[g2]}/tubes/G2 = 170$ V), the family of curves for grid voltages from 0 V to -16 V shows a sharp "knee" at low anode voltages (around 30 V to 50 V). Above this knee, the anode current remains relatively flat, which is highly desirable for minimizing distortion and maximizing efficiency in deflection output stages.

Triode Section Curves

- **Transfer Characteristics (I_a vs. V_g):** Plotted for anode voltages from 50 V to 250 V, these curves show a smooth, predictable triode transfer characteristic. Cutoff occurs around -16 V to -20 V at higher anode voltages.
- **Anode Characteristics (I_a vs. V_a):** The triode plate curves display a highly linear relationship over the typical operating region, confirming its suitability for low-distortion saw-tooth generation and amplification.
- **Mutual Conductance (g_m vs. V_g):** The mutual conductance curves for the triode section (at $V_a = 100$ V, 150 V, and 200 V) show that g_m peaks above 4 mA/V near 0 V grid bias and decreases smoothly as the grid is biased more negatively, providing a clear reference for designing stable oscillator or amplifier stages.

Technical Summary

The **16GK8** (developmental type **30PL13**) is a high-performance, dual-section **Noval-based triode-beam tetrode** designed specifically for frame time base applications in AC/DC mains television receivers.

Operating with a **16 V, 0.3 A** series heater, it integrates a voltage-amplifying triode (identical in characteristics to the **V863B** and **6/30L2**) and a rugged **7.0 W** beam tetrode capable of delivering peak anode currents up to **175 mA** (new) and **110 mA** (end of life). With its high peak pulse voltage ratings (up to **2.0 kV** positive peak) and unrestricted mounting capability, the 16GK8 represents a highly optimized solution for the vertical deflection demands of its era.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1959 Ediswan

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

1959 EDISWAN

Section 2 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak positive anode pulse voltage	2000 V	Pulse