

ELECTRONIC TUBE REFERENCE

11E16

Power - Tetrode (NOT beam) electronic tube

CONSOLIDATED TECHNICAL DATA
2 SECTIONS
CONSTRUCTION
TETRODE-TETRODE

Internally neutralized double high-frequency tetrode with center-tapped heater, designed for push-pull amplification or frequency-tripler service to approximately 600 MHz.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	12.6 V / 650 mA	PARALLEL HEATER	6.3 V / 1.3 A
HEATING	Indirect	SERIES OPERATION	Capable
CATHODE ARRANGEMENT	Common cathode	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Tetrode	
TRANSCONDUCTANCE	0.003 S
MAXIMUM PLATE VOLTAGE	600 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	10 W
Representative section for repeated identical sections.	

SECTION2 Tetrode	
TRANSCONDUCTANCE	0.003 S
MAXIMUM PLATE VOLTAGE	600 V
MAXIMUM SCREEN VOLTAGE	300 V
MAXIMUM PLATE DISSIPATION	10 W
Identical second physical section; duplicated from representative section per physical-section-row policy.	

11E16 — High-Frequency Double Tetrode

The **11E16** is an indirectly heated, internally neutralized high-frequency (H.F.) double tetrode designed for use as a push-pull amplifier or frequency trebler at frequencies up to 600 Mc/s. Manufactured under the Ediswan brand by Associated Electrical Industries (AEI) Limited, this valve features a centre-tapped heater and is optimized for high-frequency efficiency, compact physical design, and versatile power amplification.

Mechanical Construction, Base, and Pinout

The 11E16 is constructed with a compact glass envelope featuring two top-cap anode connections and a specialized seven-pin base. The internal structure is designed to minimize lead inductance and interelectrode capacitance, which is critical for stable operation at very high frequencies.

Physical Dimensions and Weight

- **Maximum Overall Length:** 85 mm
- **Maximum Seated Height:** 73 mm
- **Maximum Diameter:** 47 mm
- **Approximate Net Weight:** 2 oz (approx. 56.7 g)
- **Anode Caps:** Two top caps, wire type, 2 mm diameter

Mounting Positions

The mounting requirements depend on the operating environment:

- **Mobile Operation:** Vertical (base up or down).
- **Fixed Station Operation:** Vertical (base up or down).
- **Horizontal Operation:** Permitted only if the anode pins are aligned in a horizontal plane.

Base and Connections

The tube uses a **B7A** base with an index boss. The pinout configuration, viewed from the free end of the pins, is detailed below:

Pin / Cap	Connection	Symbol	Description
Pin 1	Heater	h	Heater connection
Pin 2	Control Grid, Section 1	g1'	Control grid for the first tetrode section
Pin 3	Screen Grid	g2', g2''	Common screen grid connection for both sections

Pin / Cap	Connection	Symbol	Description
Pin 4	Cathode, Beam Plates, Shield	k, bp, s	Common cathode, beam-forming plates, and internal shield
Pin 5	Heater Centre Tap	hct	Centre tap for dual-voltage heater operation
Pin 6	Control Grid, Section 2	g1''	Control grid for the second tetrode section
Pin 7	Heater	h	Heater connection
Cap No. 1	Anode, Section 1	a'	Top-cap anode connection for the first section
Cap No. 2	Anode, Section 2	a''	Top-cap anode connection for the second section

Heater Characteristics

The 11E16 features a centre-tapped heater, allowing it to be operated from either a 12.6 V or a 6.3 V power supply. This flexibility makes it suitable for both mobile and fixed-station equipment.

- **Series Connection (12.6 V):** The heater supply is connected across Pin 1 and Pin 7, leaving Pin 5 (centre tap) unconnected.
 - **Heater Voltage (V_h):** 12.6 V
 - **Heater Current (I_h):** 0.65 A
- **Parallel Connection (6.3 V):** Pins 1 and 7 are connected together to one side of the supply, and Pin 5 is connected to the other side.
 - **Heater Voltage (V_h):** 6.3 V
 - **Heater Current (I_h):** 1.3 A
- **Calculated Heater Power:**
 - Series configuration: $12.6\text{ V} \times 0.65\text{ A} = 8.19\text{ W}$
 - Parallel configuration: $6.3\text{ V} \times 1.3\text{ A} = 8.19\text{ W}$

Electrical Characteristics and Capacitances

The 11E16 is characterized by high transconductance and low internal feedback, aided by internal neutralization. The typical electrical characteristics for each tetrode section, measured under static Class

A conditions, are as follows:

Typical Characteristics (Per Section)

Measured at $V_a = 300\text{ V}$, $V_{[g2]}(/tubes/G2) = 250\text{ V}$, and $I_a = 20\text{ mA}$:

- **Mutual Conductance (g_m):** 3.0 mA/V
- **Inner Amplification Factor (μ_{g1-g2}):** 8.0

Inter-electrode Capacitances

The internal neutralization of the 11E16 is specifically designed to facilitate stable push-pull operation without external neutralizing circuits.

Parameter	Symbol	Value	Condition
Anode to Control Grid 1	C_{a-g1}	0.04 pF	Per section, internally neutralized
Control Grid 1 to All Other Electrodes	C_{g1-all}	7.5 pF	Per section
Anode to All Other Electrodes	C_{a-all}	2.6 pF	Per section
Input Capacitance	C_{in}	4.4 pF	Two sections in push-pull
Output Capacitance	C_{out}	1.6 pF	Two sections in push-pull

Absolute Maximum Ratings

All limiting values for the 11E16 are specified according to the **Absolute** rating system, not the Design Centre system. Under no circumstances should these limits be exceeded. The maximum ratings vary depending on the class of service.

Operating Mode Comparison Table

Parameter	Class "C" RF Push-Pull (CW / FM)	Class "C" RF Modulated (Anode & Screen)	Frequency Treble	Class "B" AF Amp / Modulator
Max. Anode Voltage ($V_{a(max)}$)	600 V*	600 V*	600 V	600 V
Max. Screen Grid Voltage ($V_{[g2](/tubes/G2)}$ (max)	300 V	300 V	300 V	300 V
Max. Negative Control Grid Voltage ($V_{g1(max)}$)	-75 V	-100 V	-200 V	-75 V
Max. Heater-to- Cathode Voltage ($V_{h-k(max)}$)	100 V	100 V	100 V	100 V
Max. Anode Dissipation ($P_{a(max)}$)	10 W†	6.7 W†	10 W†	10 W†
Max. Screen Grid Dissipation ($P_{[g2](/tubes/G2)}$ (max)	1.5 W†	1.2 W†	1.5 W†	1.5 W†
Max. Control Grid Dissipation ($P_{g1(max)}$)	0.5 W†	0.5 W†	0.5 W†	0.5 W†
Max. Peak Cathode Current ($i_{k(pk)max}$)	260 mA†	400 mA†	275 mA†	120 mA†

Parameter	Class "C" RF Push-Pull (CW / FM)	Class "C" RF Modulated (Anode & Screen)	Frequency Trebler	Class "B" AF Amp / Modulator
Max. Mean Cathode Current ($I_{k(av)max}$)	55 mA†	50 mA†	50 mA†	55 mA†
Max. Mean Control Grid Current ($I_{g1(av)max}$)	2.5 mA†	2.5 mA†	2.5 mA†	—
Max. Grid-to- Cathode Resistance (Fixed Bias)	50 kΩ†	—	50 kΩ†	50 kΩ†
Max. Grid-to- Cathode Resistance (Auto Bias)	100 kΩ†	—	100 kΩ†	100 kΩ†

† Value applies to each individual section.

Frequency-Dependent Anode Voltage Derating

At very high frequencies, dielectric losses and transit-time effects require a reduction in the maximum allowable anode voltage. The 11E16's maximum anode voltage ($V_{a(max)}$) is derated based on the operating frequency and cooling method:

1. Class "C" RF Push-Pull (CW / FM)

- **Natural Cooling:**

- Up to 150 Mc/s: $V_{a(max)} = 600$ V
- At 600 Mc/s: $V_{a(max)} = 250$ V

- **Forced Air Cooling:**

- Up to 300 Mc/s: $V_{a(max)} = 600$ V
- At 600 Mc/s: $V_{a(max)} = 400$ V

2. Class "C" RF Modulated (Anode & Screen)

- **Natural Cooling:**

- Up to 150 Mc/s: $V_{a(max)} = 600$ V

- At 600 Mc/s: $V_a(max) = 250 \text{ V}$
- **Forced Air Cooling:**
 - Up to 250 Mc/s: $V_a(max) = 600 \text{ V}$
 - At 600 Mc/s: $V_a(max) = 440 \text{ V}$

Temperature Limits

To ensure reliable operation and prevent premature envelope failure, the following absolute temperature limits must be observed:

- **Maximum Permissible Temperature of the hottest part of the bulb:** 200 °C
 - **Maximum Permissible Temperature of the base pins:** 180 °C
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Technical Summary

The **11E16** is a highly specialized, internally neutralized high-frequency double tetrode designed for push-pull RF power amplification and frequency multiplication up to 600 Mc/s. Featuring a flexible 6.3 V / 12.6 V centre-tapped heater, a B7A base, and dual top-cap anodes, it provides a compact and efficient solution for transmitter output and driver stages.

With an anode dissipation rating of up to 10 W per section (20 W total combined) and internal neutralization that simplifies circuit design by eliminating external feedback loops, the 11E16 is well-suited for Class C telegraphy, FM telephony, frequency trebling, and Class B audio modulation. Designers must carefully observe the absolute maximum ratings, particularly the frequency-dependent anode voltage derating and the strict bulb and pin temperature limits, to ensure optimal performance and longevity.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 AEI Industrial Valves

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

1961 AEI INDUSTRIAL VALVES

Section 1 · Tetrode

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum operating frequency	600 MHz	—

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Inner amplification factor	8	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Associated Electrical Industries

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

1961 ASSOCIATED ELECTRICAL INDUSTRIES

Section 1 · Tetrode

OTHER

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum operating frequency	600 MHz	—

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Inner amplification factor	8	—

TUBE TINKER

An independent reference for electronic tubes, vacuum tubes,
and their source documents.

