



ELECTRONIC TUBE REFERENCE

111H

Power - Triode electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
TRIODE

Radiation-cooled Amperex transmitting triode for RF power amplification and oscillation, with Class B audio-amplifier or modulator service also specified. Rated for 75 W plate dissipation and operation to approximately 30 MHz.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	4
NOMINAL HEATER	10 V / 2.5 A	PARALLEL HEATER	— / —
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Triode	
TRANSCONDUCTANCE	0.0042 S
AMPLIFICATION FACTOR	23
MAXIMUM PLATE VOLTAGE	1750 V
MAXIMUM PLATE DISSIPATION	75 W
<i>Published ratings/characteristics promoted where applicable; additional values retained as parameters.</i>	

111H — Radiation-Cooled Transmitting Triode

The **111H** (also designated as the **111-H**) is a radiation-cooled triode designed by Amperex Engineering Laboratories for use as an R.F. power amplifier, oscillator, and Class B audio frequency amplifier or modulator. It belongs to a distinctive group of low-voltage, high-current tubes characterized by a high ratio of transconductance to interelectrode capacitance, which provides high efficiency in high-frequency circuits.

Mechanical Construction and Physical Dimensions

The 111H features a robust physical design suited for high-power transmitter applications. The tube is constructed with a glass envelope and a top-mounted plate terminal to isolate the high-voltage anode from the grid and filament connections.

Physical Dimensions and Weights

- **Maximum Overall Length:** 8 1/2 inches
- **Greatest Radius:** 2 1/16 inches
- **Maximum Bulb Diameter:** 2 1/8 inches
- **Height (Base to Top of Cap):** 8 1/2 ± 1/4 inches
- **Base Diameter:** 1.840 inches (minimum) to 1.867 inches (maximum)
- **Net Weight (Approximate):** 5 ounces
- **Shipping Weight (Approximate, single tube):** 2 pounds

Base and Terminal Connections

The tube utilizes a **Standard Jumbo 4-pin Bayonet** base. The pins have a diameter of 0.187 ± 0.003 inches, with spacing of 0.688 inches and 0.971 inches. The pinout configuration, viewed from the bottom of the base, is as follows:

- **Pin 1:** Filament
- **Pin 2:** Grid
- **Pin 3:** No Connection (N.C.)
- **Pin 4:** Filament
- **Top Cap:** Plate (Medium skirted cap, 0.566 ± 0.007 inches diameter, 0.400 inches minimum height)

Mounting Positions

The 111H can be mounted in either vertical or horizontal positions:

- **Vertical Mounting:** Base up or base down.
- **Horizontal Mounting:** Allowed provided the plane of the electrodes is oriented vertically.

Electrical Characteristics and Filament Ratings

The 111H features a thoriated tungsten filament designed for high emission stability. The primary electrical characteristics and interelectrode capacitances are detailed below:

Parameter	Value
Filament Material	Thoriated Tungsten
Filament Voltage	10.0 to 10.5 V

Parameter	Value
Filament Current	2.5 A
Amplification Factor	23
Transconductance ($I_p = 100$ mA, grid-to-plate)	4200 μ mhos
Frequency for Maximum Ratings	30 mc

Direct Interelectrode Capacitances

- **Grid to Plate:** 4.6 μ f
- **Grid to Filament:** 5.0 μ f
- **Plate to Filament:** 2.9 μ f

Audio Frequency Class B Amplifier or Modulator Service

In Class B audio service, the 111H can be operated as a power amplifier or modulator. Typical operation is specified for a push-pull configuration using two tubes.

Maximum Ratings (Per Tube)

- **D.C. Plate Voltage:** 1750 V
- **Max. Signal Plate Current:** 150 mA
- **Max. Signal Plate Input:** 240 W
- **Plate Dissipation:** 75 W

Typical Operation (Two Tubes)

Parameter	Operating Point A	Operating Point B
A.C. Filament Voltage	10 V	10 V
D.C. Plate Voltage	1500 V	1750 V
D.C. Grid Voltage	-52 V	-62 V
Load Resistance (per tube)	3000 Ω	4000 Ω
Effective Load Resistance (plate-to-plate)	12000 Ω	16000 Ω
Zero-Signal Plate Current	50 mA	40 mA
Peak A.F. Grid-to-Grid Voltage	264 V	324 V

Parameter	Operating Point A	Operating Point B
Max. Signal Plate Current	270 mA	270 mA
Max. Signal Driving Power (approx.)	2 W	9 W
Max. Signal Power Output (approx.)	260 W	350 W

Radio Frequency (R.F.) Amplifier and Oscillator Service

The 111H is highly versatile in R.F. applications, with documented operating conditions across Class B Telephony, Class C Telegraphy, Plate-Modulated Class C, and Grid-Modulated Class C modes.

1. R.F. Power Amplifier — Class B Telephony

This mode is intended for carrier conditions with modulation factors up to 1.0.

- **Maximum Ratings (Per Tube):**
 - D.C. Plate Voltage: 1500 V
 - D.C. Plate Current: 100 mA
 - Plate Input: 115 W
 - Plate Dissipation: 75 W
- **Typical Operation (One Tube):**
 - A.C. Filament Voltage: 10 V
 - D.C. Plate Voltage: 1300 V
 - D.C. Grid Voltage: -55 V
 - Peak R.F. Grid Voltage: 80 V
 - D.C. Plate Current: 75 mA
 - Plate Input: 112 W
 - D.C. Grid Current (approx.): 1.5 mA
 - Plate Dissipation: 70 W
 - Grid Driving Power at Modulation Peak (approx.): 3 W
 - Power Output (approx.): 42 W

2. R.F. Power Amplifier — Class C Telegraphy

- **Maximum Ratings (Per Tube, up to 30 mc):**
 - D.C. Plate Voltage: 1500 V
 - D.C. Grid Voltage: -500 V
 - D.C. Plate Current: 160 mA

- Plate Input: 225 W
- D.C. Grid Current (approx.): 30 mA
- Plate Dissipation: 75 W

• **Typical Operation (One Tube):**

Parameter	Option 1	Option 2	Option 3
A.C. Filament Voltage	10 V	10 V	10 V
D.C. Plate Voltage	1000 V	1250 V	1500 V
D.C. Grid Voltage	-120 V	-200 V	-200 V
Peak R.F. Grid Voltage	250 V	330 V	340 V
D.C. Plate Current	150 mA	130 mA	150 mA
Plate Input	150 W	162 W	225 W
D.C. Grid Current (approx.)	21 mA	18 mA	18 mA
Plate Dissipation	44 W	42 W	55 W
Driving Power (approx.)	5 W	6 W	6 W
Power Output (approx.)	106 W	120 W	170 W

3. Plate-Modulated R.F. Power Amplifier — Class C

This mode is rated for carrier conditions with a modulation factor of 1.0.

• **Maximum Ratings (Per Tube, up to 30 mc):**

- D.C. Plate Voltage: 1250 V
- D.C. Grid Voltage (Total): -300 V
- D.C. Plate Current: 120 mA
- Plate Input: 140 W
- D.C. Grid Current (approx.): 30 mA
- Plate Dissipation: 50 W
- F.C.C. Broadcast Rating (Nearest Classification for Final Stage Use): 75 W

• **Typical Operation (One Tube):**

Parameter	Option 1	Option 2
A.C. Filament Voltage	10.5 V	10.5 V
D.C. Plate Voltage	1000 V	1250 V

Parameter	Option 1	Option 2
D.C. Grid Voltage (Total)	-200 V	-250 V
Fixed Bias (approx.)	-30 V	-40 V
Grid Resistor (approx.)	8500 Ω	10000 Ω
Peak R.F. Grid Voltage	330 V	380 V
D.C. Plate Current	120 mA	110 mA
Plate Input	120 W	137 W
D.C. Grid Current (approx.)	20 mA	21 mA
Plate Dissipation	30 W	32 W
Driving Power (approx.)	6.5 W	8 W
Plate Power Output (approx.)	90 W	105 W

4. Grid-Modulated R.F. Power Amplifier — Class C

This mode is rated for carrier conditions with a modulation factor of 1.0.

- **Maximum Ratings (Per Tube):**

- D.C. Plate Voltage: 1500 V
- D.C. Grid Voltage (Fixed Voltage): -300 V
- Plate Input: 110 W
- Plate Dissipation: 75 W

- **Typical Operation (One Tube):**

- A.C. Filament Voltage: 10.0 V
- D.C. Plate Voltage: 1500 V
- D.C. Grid Voltage (Fixed Voltage): -280 V
- Peak R.F. Grid Voltage: 340 V
- D.C. Plate Current: 72 mA
- Plate Input: 108 W
- D.C. Grid Current (approx.): 1.5 mA
- Plate Dissipation: 66 W
- Grid Driving Power at Modulation Peak (approx.): 6 W
- Power Output (approx.): 42 W

High-Frequency and Self-Excited Oscillator Operation

The 111H is rated for operation at frequencies up to 60 mc. At elevated frequencies, the maximum ratings are adjusted to account for increased dielectric losses and circulating currents.

Maximum Ratings for Self-Excited High Frequency Oscillator or Power Amplifier (Class C)

Parameter	At 30 mc	At 60 mc
D.C. Plate Voltage	1500 V	1200 V
Modulated D.C. Plate Voltage	1250 V	1000 V
A.C. Plate Voltage	1500 V	1500 V
D.C. Plate Current	160 mA	160 mA
D.C. Grid Bias Voltage	-500 V	-250 V
D.C. Grid Current	30 mA	30 mA
Plate Dissipation	75 W	60 W

Typical High Frequency Performance (Two Tubes in Tuned-Grid Tuned-Plate Push-Pull Circuits)

- **At 30 mc:**
 - Plate Voltage: 1500 V A.C.
 - Plate Current: 280 mA
 - Power Delivered to Load Circuit: 260 W
- **At 60 mc:**
 - Plate Voltage: 1200 V D.C.
 - Plate Current: 260 mA
 - Power Delivered to Load Circuit: 220 W

Characteristic Curves and Design Interpretation

The published curves for the 111H provide graphical data for circuit design and load-line analysis under a nominal filament voltage (E_f) of 10.5 Volts A.C.

- **Plate Characteristics (Plate Milliamperes vs. Plate Volts):** These curves show the relationship between plate current and plate voltage across a wide range of grid bias voltages. The positive grid region (up to +180 V) and negative grid region (down to -120 V) are mapped, illustrating the tube's capability to handle high peak currents (up to 1200 mA) when driven positive.

- **Grid Characteristics (Grid Milliamperes vs. Plate Volts):** This family of curves maps grid current against plate voltage for positive grid voltages ranging from +20 V to +180 V. These curves are essential for calculating grid driving power and designing grid bias networks.
 - **Constant Current Characteristics (Plate Volts vs. Grid Volts):** Dated September 1947, these curves plot plate voltage against grid voltage for constant values of plate current (from 0.05 to 1.5 Amperes) and grid current (from 5 to 200 mA). They are particularly useful for Class C amplifier design and load-line calculations.
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Technical Summary

The **111H** is a high-efficiency, radiation-cooled transmitting triode featuring a thoriated tungsten filament (10 to 10.5 V, 2.5 A) and an amplification factor of 23. Designed by Amperex Engineering Laboratories, it is optimized for high-frequency operation up to 60 mc, offering an exceptional transconductance-to-capacitance ratio. With a maximum plate dissipation rating of 75 W (reduced to 60 W at 60 mc) and a Standard Jumbo 4-pin Bayonet base, the 111H serves as a reliable power amplifier, oscillator, or modulator in medium-power transmitter designs.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1953 Amperex

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

1953 AMPEREX

Section 1 · Triode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum frequency	30 MHz	—