

ELECTRONIC TUBE REFERENCE

16BQ11

Voltage - Dual Pentode electronic tube

CONSOLIDATED TECHNICAL DATA

2 SECTIONS

CONSTRUCTION

PENTODE-PENTODE

Semiremote-cutoff dual pentode designed for television intermediate-frequency amplification, electrically cross-referenced to the 11BQ11 apart from heater characteristics.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12DM	BASE PINS	12
NOMINAL HEATER	16 V / 315 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Dissimilar

12DM - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1	–	H – Heater	CONNECTED
PIN2	B	P – Plate (Anode)	CONNECTED
PIN3	B	G2 – Screen Grid	CONNECTED
PIN4	B	G3 – Suppressor Grid	CONNECTED
PIN5	B	G1 – Control Grid	CONNECTED
PIN6	B	K – Cathode	CONNECTED
PIN7	A	G3 – Suppressor Grid	CONNECTED
PIN7	–	IS – Internal Screen	CONNECTED
PIN8	A	P – Plate (Anode)	CONNECTED
PIN9	A	G2 – Screen Grid	CONNECTED
PIN10	A	G1 – Control Grid	CONNECTED
PIN11	A	K – Cathode	CONNECTED
PIN12	–	H – Heater	CONNECTED

SECTION1 Pentode	
PLATE RESISTANCE	200000 Ω
TRANSCONDUCTANCE	0.0105 S
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM SCREEN VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3.1 W
MAXIMUM SCREEN DISSIPATION	0.65 W
Heater-variant reference sheet; electrical data explicitly cross-referenced to 11BQ11.	

SECTION2 Pentode	
PLATE RESISTANCE	200000 Ω
TRANSCONDUCTANCE	0.013 S
MAXIMUM PLATE VOLTAGE	330 V
MAXIMUM SCREEN VOLTAGE	330 V
MAXIMUM PLATE DISSIPATION	3.1 W
MAXIMUM SCREEN DISSIPATION	0.65 W
Heater-variant reference sheet; electrical data explicitly cross-referenced to 11BQ11.	

16BQ11 — Semiremote-Cutoff Dual Pentode

The **16BQ11** is a duodecar-type multi-unit vacuum tube containing two independent pentodes in a single envelope. It is designed primarily for use as an intermediate-frequency (IF) amplifier in television receivers. The tube features a semiremote-cutoff pentode (Unit No. 1) and a sharp-cutoff pentode (Unit No. 2), providing circuit designers with two distinct characteristics in a single compact device.

Overview and Family Relationship

The 16BQ11 belongs to a family of dual pentodes that includes the [8BQ11](#) and [11BQ11](#). These three types are electrically identical in their pentode structures, maximum ratings, and typical operating characteristics, differing only in their heater configurations. The 16BQ11 is specifically designed with a **16 V** heater for series-string heater arrangements in television receivers.

Construction, Heater, and Pinout

The 16BQ11 is constructed in a duodecar glass envelope requiring a standard 12-contact socket. The internal structure features two separate pentode units with independent cathode connections, sharing a

common heater. An internal shield is incorporated to minimize capacitive coupling between the two units.

Heater Characteristics

The heater is designed for AC or DC operation. The nominal heater power can be calculated from the rated voltage and current:

$$\text{Heater Power} = 16 \text{ V} \times 0.315 \text{ A} = 5.04 \text{ W}$$

Parameter	Value
Heater Voltage (AC/DC)	16 V
Heater Current	0.315 A
Average Heater Warm-up Time	11 seconds
Maximum Heater-Cathode Peak Voltage	≤ 200 V
Maximum Heater-Cathode Average Voltage	100 V

Pin Connection (12DM Base)

The 16BQ11 utilizes the **12DM** basing arrangement, with the following pin assignments viewed from the bottom of the tube:

- **Pin 1:** Grid No. 1, Unit No. 1 (G1P1)
- **Pin 2:** Grid No. 2, Unit No. 2 (G2P2)
- **Pin 3:** Plate, Unit No. 2 (PP2)
- **Pin 4:** Grid No. 3, Unit No. 2 (G3P2)
- **Pin 5:** Cathode, Unit No. 2 (KP2)
- **Pin 6:** Grid No. 1, Unit No. 2 (G1P2)
- **Pin 7:** Grid No. 3, Unit No. 1, and Internal Shield (G3P1, IS)
- **Pin 8:** Plate, Unit No. 1 (PP1)
- **Pin 9:** Grid No. 2, Unit No. 1 (G2P1)
- **Pin 10:** Cathode, Unit No. 1 (KP1)
- **Pin 11:** Heater (H)
- **Pin 12:** Heater (H)

Interelectrode Capacitances

To ensure stable high-frequency operation, the 16BQ11 is designed with low direct interelectrode capacitances. The internal shield is connected to Pin 7 along with Grid No. 3 of Unit No. 1.

Unit Capacitances

Capacitance Parameter	Unit No. 1	Unit No. 2
Grid No. 1 to Plate	0.022 pF	0.024 pF
Grid No. 1 to Cathode, Heater, Grid No. 2, Grid No. 3, and Internal Shield	10 pF	—
Plate to Cathode, Heater, Grid No. 2, Grid No. 3, and Internal Shield	2.8 pF	—
Grid No. 1 to Cathode, Heater, Grid No. 2, Grid No. 3, Grid No. 3 of Unit No. 1, and Internal Shield	—	11 pF
Plate to Cathode, Heater, Grid No. 2, Grid No. 3, Grid No. 3 of Unit No. 1, and Internal Shield	—	2.8 pF

Inter-Unit Capacitances

The capacitive isolation between the two pentode sections is characterized by the following extremely low values:

- **Plate of Unit No. 1 to Plate of Unit No. 2:** 0.015 pF
- **Grid No. 1 of Unit No. 1 to Plate of Unit No. 2:** 0.002 pF
- **Grid No. 1 of Unit No. 2 to Plate of Unit No. 1:** 0.008 pF
- **Grid No. 1 of Unit No. 1 to Grid No. 1 of Unit No. 2:** 0.002 pF

Maximum Ratings (Design-Maximum Values)

The maximum ratings define the operating envelopes for Class A1 amplifier service. These ratings are identical for both pentode units:

- **Plate Voltage:** 330 V
- **Grid-No. 3 (Suppressor-Grid) Voltage:** 0 V
- **Grid-No. 2 (Screen-Grid) Supply Voltage:** 330 V
- **Grid-No. 2 Voltage:** Subject to rating curves for voltages between 165 V and 330 V
- **Grid-No. 1 (Control-Grid) Voltage, Positive-bias value:** 0 V
- **Plate Dissipation:** 3.1 W
- **Grid-No. 2 Input:**
 - For Grid-No. 2 voltages up to 165 V: 0.65 W
 - For Grid-No. 2 voltages between 165 V and 330 V: Subject to rating curves

Electrical Characteristics and Class A1 Operation

At the typical operating point, both units are operated with a plate supply of 125 V and a screen-grid voltage of 125 V. Grid No. 3 is connected directly to the cathode at the socket.

Parameter	Unit No. 1	Unit No. 2
Plate Supply Voltage	125 V	125 V
Grid-No. 2 Voltage	125 V	125 V
Cathode-Bias Resistor	56 Ω	56 Ω
Plate Resistance (Approx.)	0.2 M Ω	0.2 M Ω
Transconductance	10,500 μmhos	13,000 μmhos
Plate Current	11 mA	11 mA
Grid-No. 2 Current	3.5 mA	3.8 mA

Cutoff Characteristics

The primary distinction between the two units lies in their control-grid cutoff characteristics:

- **Unit No. 1 (Semiremote-Cutoff):** Requires an approximate Grid-No. 1 voltage of **-15 V** to reduce the transconductance to 50 μmhos . This gradual cutoff characteristic is ideal for stages requiring automatic gain control (AGC) without introducing severe distortion.
- **Unit No. 2 (Sharp-Cutoff):** Requires an approximate Grid-No. 1 voltage of **-3 V** to reduce the plate current to 20 μA . This sharp cutoff characteristic is optimized for high-gain, stable amplification where AGC is not applied.

Maximum Circuit Values

The maximum allowable control-grid circuit resistance for cathode-bias operation is:

- **Unit No. 1:** 1.0 M Ω
- **Unit No. 2:** 0.25 M Ω

Technical Summary

The **16BQ11** is a high-performance duodecar dual pentode designed for television IF amplifier applications. By combining a semiremote-cutoff pentode (Unit No. 1, $g_m = 10,500 \mu\text{mhos}$) and a sharp-cutoff pentode (Unit No. 2, $g_m = 13,000 \mu\text{mhos}$) in a single envelope, it provides a highly integrated solution for multi-stage IF strips. Operating with a **16 V, 0.315 A** heater, the tube features excellent inter-unit isolation (plate-to-plate capacitance of only 0.015 pF) and robust design-maximum ratings, including a maximum plate voltage of **330 V** and plate dissipation of **3.1 W** per unit.



SOURCE OPERATING CONDITIONS

1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HeaterOrFilamentVoltageNominal	16 V	—
HeaterOrFilamentCurrentNominal	315 mA	—



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1975 RCA RC30

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

1975 RCA RC30

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate supply voltage	125 V	ClassA
Screen-grid voltage	125 V	ClassA
Cathode-bias resistor	66 ohm	ClassA
Plate current	11 mA	ClassA
Screen-grid current	3.6 mA	ClassA
Transconductance	10500 uS	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1-to-plate capacitance	0.022 pF	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate supply voltage	125 V	ClassA
Screen-grid voltage	125 V	ClassA
Cathode-bias resistor	66 ohm	ClassA
Plate current	11 mA	ClassA
Screen-grid current	3.8 mA	ClassA
Transconductance	13000 uS	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.1-to-plate capacitance	0.024 pF	—

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