

ELECTRONIC TUBE REFERENCE

12B7ML

Voltage - Pentode Remote Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
PENTODE

Metal remote-cutoff pentode for RF voltage amplification, combining variable-mu gain control with a 12.6 V series heater.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	8
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Pentode	
PLATE RESISTANCE	800000 Ω
TRANSCONDUCTANCE	0.002 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	100 V
RF voltage amplifier.	

12B7ML — Remote Cut-Off R.F. Pentode

The **12B7ML** (also designated as 12B7(ML)) is a remote cut-off radio-frequency (R.F.) pentode vacuum tube designed for Class A voltage amplifier service. Sponsored by the General Electric Company and registered in July 1939, this metal-envelope tube features an indirectly heated cathode and is constructed with a locking 8-pin base. Its remote cut-off characteristic makes it highly suitable for automatic volume control (AVC) or automatic gain control (AGC) circuits in radio-frequency and intermediate-frequency amplifier stages, where it can handle a wide range of signal amplitudes with minimal distortion.

Physical Construction and Basing

The 12B7ML is constructed with a metal bulb envelope and does not utilize an external top cap, keeping all electrode connections routed through its base. It features a locking 8-pin base with an **8 V** basing designation. The physical dimensions of the tube are compact, designed to fit standard equipment layouts:

- **Maximum Diameter:** 1 3/16 inches
- **Maximum Overall Length:** 2 25/32 inches
- **Maximum Seated Height:** 2 1/4 inches

The tube is designed to operate in **any mounting position**, providing flexibility in physical chassis layout.

The pin connections, viewed from the bottom of the locking 8-pin base, are assigned as follows:

Pin	Connection
Pin 1	Heater
Pin 2	Plate
Pin 3	Screen Grid (G_2)
Pin 4	Suppressor Grid (G_3)
Pin 5	Internal Shield
Pin 6	Control Grid (G_1)
Pin 7	Cathode
Pin 8	Heater

The inclusion of an internal shield connected to Pin 5 helps minimize internal coupling and electromagnetic interference, which is critical for stable high-frequency amplification.

Heater and Electrical Ratings

The 12B7ML is equipped with an indirectly heated cathode (heater-type cathode). The heater is designed for operation in 12-volt systems, typically found in automotive or AC/DC receiver designs.

The electrical ratings for the heater and the maximum limits under Class A voltage amplifier service are:

- **Heater Voltage:** 12.6 volts
- **Heater Current:** 0.15 amperes
- **Maximum Plate Voltage:** 250 volts
- **Maximum Screen Voltage (G_2):** 100 volts

These maximum ratings represent the absolute limits within which the tube must be operated to ensure reliable performance and longevity.

Class A Typical Operation and Characteristics

In Class A voltage amplifier service, the 12B7ML can be operated under different voltage conditions. The typical operating points demonstrate the tube's performance at moderate and maximum rated plate voltages:

Parameter	Operating Point I	Operating Point II
Plate Voltage	100 V	250 V
Screen Voltage (G_2)	100 V	100 V
Grid Voltage (G_1)	-3 V	-3 V
Suppressor Voltage (G_3)	0 V	0 V
Plate Resistance	0.25 M Ω	0.8 M Ω
Transconductance	1900 μ mhos	2000 μ mhos
Plate Current	8.9 mA	9.2 mA
Screen Current	2.6 mA	2.4 mA

Remote Cut-off Characteristic

As a remote cut-off pentode, the transconductance of the 12B7ML can be varied smoothly over a wide range by adjusting the control grid bias. Under typical operating conditions (with a plate voltage of 250 V and screen voltage of 100 V), applying a grid bias of **-35 volts** reduces the transconductance to a nominal value of **10 μ mhos**. This wide bias range allows the tube to handle strong signals without clipping, making it ideal for receiver circuits employing automatic gain control.

Direct Interelectrode Capacitances

To ensure stable operation in high-frequency circuits, the 12B7ML is designed with low direct interelectrode capacitances. The maximum and typical values are:

- **Grid to Plate (G_1 to Plate):** 0.005 mmf (maximum)
- **Input (G_1 to all other electrodes except Plate):** 5.5 mmf
- **Output (Plate to all other electrodes except G_1):** 7.0 mmf

The extremely low grid-to-plate capacitance of 0.005 mmf maximum is achieved through the pentode structure and the internal shield (connected to Pin 5), which minimizes feedback from the plate to the control grid, thereby preventing unwanted oscillations in high-gain R.F. stages.

Technical Summary

The **12B7ML** is a metal-envelope, remote cut-off R.F. pentode featuring a locking 8-pin base and an indirectly heated cathode. Operating with a **12.6 V, 0.15 A** heater, it is optimized for Class A voltage

amplification in radio-frequency and intermediate-frequency stages. With a maximum plate voltage rating of **250 V** and screen voltage rating of **100 V**, it delivers a transconductance of **1900 to 2000 μmhos** under typical operating conditions. Its remote cut-off characteristic is demonstrated by its ability to reduce transconductance to **10 μmhos** at a grid bias of **-35 V**. The combination of low grid-to-plate capacitance (0.005 mmf max), an internal shield, and a robust locking base design makes the 12B7ML a reliable component for stable, high-gain amplification in early electronic receiver designs.

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