



ELECTRONIC TUBE REFERENCE

12BL6

Voltage - Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Low-voltage remote-cutoff pentode for automobile-radio RF/IF amplification with heater, plate, and screen supplies obtained directly from the vehicle battery.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	12.6 V / 150 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	500000 Ω
TRANSCONDUCTANCE	0.00135 S
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM SCREEN VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	20 mA
Remote-cutoff 12-V automobile RF/IF pentode.	

12BL6 — Remote Cut-Off Miniature Pentode

The **12BL6** is a miniature, remote cut-off pentode designed for use as a radio-frequency (RF) or intermediate-frequency (IF) amplifier. It is specifically engineered for operation in automobile radio receivers where the heater, plate, and screen grid potentials are obtained directly from a nominal 12-volt automotive storage battery. This design eliminates the need for a high-voltage power supply, allowing the tube to operate directly from low-voltage DC sources.

Construction, Mechanical Specifications, and Pinout

The 12BL6 is constructed in a T-5 1/2 glass envelope with a 7-pin miniature button base (E7-1 designation). It features a coated unipotential cathode and can be mounted and operated in any position.

Physical Dimensions

- **Maximum Diameter:** 0.750 inches
- **Maximum Seated Height:** 1.875 inches
- **Maximum Overall Height:** 2.125 inches

Pin Connections and Basing

The tube utilizes the 7BK basing diagram. The pin assignments, viewed from the bottom of the base, are as follows:

Pin Number	Connection
Pin 1	Grid Number 1 (Control Grid)
Pin 2	Grid Number 3 (Suppressor Grid) and Internal Shield
Pin 3	Heater
Pin 4	Heater
Pin 5	Plate
Pin 6	Grid Number 2 (Screen Grid)
Pin 7	Cathode

Heater Characteristics and Automotive Battery Operation

The heater of the 12BL6 is designed to run on either AC or DC power. Because the tube is intended for direct connection to an automotive electrical system, its heater is specifically rated to withstand the wide voltage fluctuations typical of a vehicle's battery and charging system.

- **Nominal Heater Voltage:** 12.6 V
- **Nominal Heater Current:** 0.15 A (150 mA)
- **Calculated Heater Power:** 1.89 W (calculated as 12.6 V multiplied by 0.15 A)
- **Permissible Automotive Voltage Range:** 10.0 V to 15.9 V

While the heater is designed to operate across this wide range to accommodate automotive battery variations, prolonged operation near these extreme limits affects performance and longevity. Operation at the lower limit of 10.0 V results in a sacrifice in electrical performance, while continuous operation at the

upper limit of 15.9 V reduces the life expectancy of the tube. Improved supply-voltage regulation is recommended to maximize equipment reliability.

Electrical Ratings

The maximum ratings of the 12BL6 are established under the Design-Center System. These ratings provide an adequate safety factor to ensure the tube can withstand the voltage variations encountered in automotive service.

Parameter	Rating
Maximum Plate Voltage	30 V
Maximum Grid Number 2 (Screen) Voltage	30 V
Maximum DC Cathode Current	20 mA
Maximum Heater-Cathode Voltage (Heater Positive)	30 V
Maximum Heater-Cathode Voltage (Heater Negative)	30 V
Maximum Grid Number 1 Circuit Resistance	10 M Ω

Typical Operating Conditions and Characteristics

In typical Class A1 amplifier service, the 12BL6 operates with low plate and screen voltages supplied directly from the 12-volt battery system. The typical operating parameters are:

- **Plate Voltage:** 12.6 V
- **Grid Number 3 (Suppressor) Voltage:** 0 V (connected to cathode at the socket)
- **Grid Number 2 (Screen) Voltage:** 12.6 V
- **Grid Number 1 (Control Grid) Supply Voltage:** 0 V
- **Grid Number 1 Resistor:** 2.2 M Ω
- **Grid Number 1 Developed Voltage:** -0.65 V (This is an average contact-potential bias developed across the 2.2 M Ω grid resistor)
- **Plate Current:** 1.35 mA (1350 μ A)
- **Grid Number 2 (Screen) Current:** 0.5 mA (500 μ A)
- **Plate Resistance (Approximate):** 0.5 M Ω
- **Transconductance (Grid Number 1 to Plate):** 1350 μ mhos

Remote Cut-Off Characteristics

As a remote cut-off pentode, the transconductance of the 12BL6 can be controlled over a wide range by varying the control grid bias. The typical grid bias required to reduce the transconductance to a very low level is specified under two conditions:

- **For a transconductance of 10 μmhos (Grid 1 control only):** An approximate Grid Number 1 voltage of -6.0 V is required (with Grid Number 3 at 0 V).
- **For a transconductance of 10 μmhos (Combined Grid 1 and Grid 3 control):** An approximate voltage of -5.0 V applied to both Grid Number 1 and Grid Number 3 is required.

Interelectrode Capacitances

The direct interelectrode capacitances of the 12BL6 are measured with an external shield (specifically shield number 316) connected to Pin 7 (cathode):

- **Grid Number 1 to Plate (Maximum):** 0.006 pF
- **Input Capacitance (Grid 1 to Cathode, Heater, Screen, and Suppressor):** 5.5 pF
- **Output Capacitance (Plate to Cathode, Heater, Screen, and Suppressor):** 4.8 pF

These low capacitances, particularly the extremely low grid-to-plate feedback capacitance, are critical for stable operation in high-frequency RF and IF amplifier stages.

Characteristic Curves and Operating Behavior

The published electrical characteristics of the 12BL6 are illustrated by two distinct sets of curves representing different operating conditions.

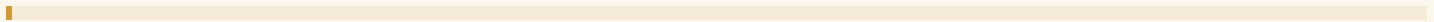
Low-Voltage Characteristics

The primary operating curves reflect the low-voltage design of the tube, where the plate voltage is swept from 0 to 28 Volts.

- **Average Plate Characteristics:** At a screen voltage of 12.6 V and suppressor voltage of 0 V, the plate current rises rapidly as plate voltage increases from 0 to approximately 4 V, after which it flattens out, demonstrating typical pentode behavior. The curves are plotted for various Grid Number 1 voltages ranging from 0 V down to -2.4 V. For example, at a Grid Number 1 voltage of 0 V, the plate current reaches approximately 1.3 mA at a plate voltage of 12.6 V. The screen current is also shown, decreasing slightly as plate voltage increases, stabilizing around 0.5 mA at typical operating voltages.
- **Average Transfer Characteristics:** These curves plot plate current, screen current, and transconductance against Grid Number 1 supply voltage from 0 V down to -5 V, with plate and screen voltages held at 12.6 V. The curves show that transconductance decreases smoothly from its peak of 1350 μmhos at 0 V bias down to near-zero as the grid voltage approaches -5 V, illustrating the remote cut-off characteristic.

High-Voltage Reference Curves

Some reference documentation includes an alternative set of average plate characteristics extending up to a plate voltage of 800 V and plate currents up to 50 mA, with grid bias curves from 0 V to -40 V. While these curves show the theoretical behavior of the pentode structure under high-voltage conditions, they represent operating regimes far exceeding the tube's absolute maximum design-center ratings (which limit both plate and screen voltages to 30 V). For practical and safe circuit design, the low-voltage characteristics must be adhered to.





SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	12.6 V	Nominal
Heater current	150 mA	Nominal
Plate voltage	30 V	Typical operating conditions
Screen voltage	12.6 V	Typical operating conditions



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1966 Tung Sol Electronic Tubes 2 of 4

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

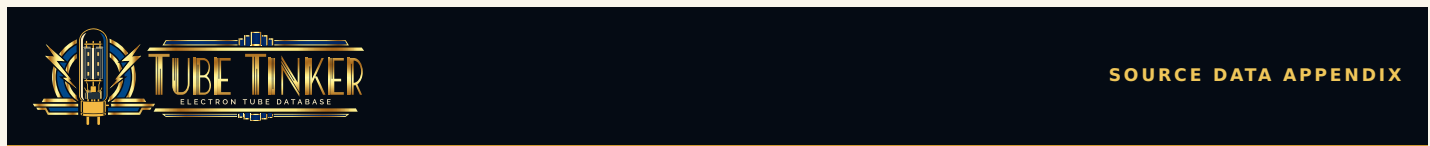
1966 TUNG SOL ELECTRONIC TUBES 2 OF 4

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM CATHODE CURRENT	20 mA	Published datasheet
GRID #1 VOLTAGE A	0 V	Published datasheet
TRANSCONDUCTANCE U	1 uS	Published datasheet; operating column 1
TRANSCONDUCTANCE U	350 uS	Published datasheet; operating column 2
FOR Gm g =	10 V	Published datasheet; operating column 1
FOR Gm g =	-6 V	Published datasheet; operating column 2
FOR G m6 =	10 V	Published datasheet; operating column 1
FOR G m6 =	-5 V	Published datasheet; operating column 2

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	30 V	Published datasheet; promoted section value
Maximum screen voltage	30 V	Published datasheet; promoted section value

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID #3 VOLTAGE	0 V	Published datasheet
Plate resistance	500000 ohm	Published datasheet; promoted section value
Transconductance	0.00135 A/V	Published datasheet; promoted section value



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

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
Plate Voltage	30 V	DesignCenter
Screen Voltage	30 V	DesignCenter
DC Cathode Current	20 mA	DesignCenter
Plate Voltage	12.6 V	ClassA
Screen Voltage	12.6 V	ClassA
Plate Resistance	500000 ohm	ClassA
Plate Current	1.35 mA	ClassA
Screen Current	0.5 mA	ClassA

TUBE TINKER

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