ELECTRONIC TUBE REFERENCE

12AC6

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, designed to operate its heater, plate, and screen directly from a 12 V battery.

General characteristics

BASE DESIGNATION	7BK	**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

7BK - Terminal pinout

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 — G1	A	G1 — Control Grid	CONNECTED
PIN2 — G3	A	G3 — Suppressor Grid	CONNECTED
PIN2 — IS	A	IS — Internal Screen	CONNECTED
PIN3 — H	—	H — Heater	CONNECTED
PIN4 — H	—	H — Heater	CONNECTED
PIN5 — P	A	P — Plate (Anode)	CONNECTED
PIN6 — G2	A	G2 — Screen Grid	CONNECTED
PIN7 — K	A	K — Cathode	CONNECTED

Section ratings

SECTION1 Pentode	
PLATE RESISTANCE	500000 Ω
TRANSCONDUCTANCE	0.00073 S
MAXIMUM PLATE VOLTAGE	30 V
MAXIMUM SCREEN VOLTAGE	30 V
MAXIMUM CATHODE CURRENT	20 mA

Published ratings and characteristics promoted from the supplied Brimar source.

12AC6 — Remote Cut-Off Pentode

The **12AC6** is a miniature, indirectly heated remote cut-off pentode (also characterized as a vari-mu pentode) designed primarily for use as a radio-frequency (RF) or intermediate-frequency (IF) amplifier in mobile and automotive receivers. The defining design feature of the 12AC6 is its ability to operate with its heater, plate, and screen grid potentials supplied directly from a nominal 12-volt automotive battery system, eliminating the need for a high-voltage vibrator power supply.

Physical Construction and Pinout Variations

The 12AC6 is constructed in a miniature glass envelope (T-5 1/2 bulb) with a coated unipotential cathode. It features a miniature button 7-pin base (7BK) and can be mounted in any position.

Physical Dimensions

- **Maximum Overall Length:** 2 1/8 inches
- **Maximum Seated Height / Bulb Length:** 1 7/8 inches
- **Maximum Diameter:** 3/4 inch

Pin Connection Discrepancy

Documented pin connections for the 7BK base of the 12AC6 exhibit a critical variation regarding the assignments of Pin 2 and Pin 7. Depending on the manufacturing specification, two distinct configurations exist:

Pin	Configuration A	Configuration B
Pin 1	Grid No. 1 (G_1)	Grid No. 1 (G_1)
Pin 2	Cathode (K)	Grid No. 3 (G_3) / Internal Shield (S_i)
Pin 3	Heater (H)	Heater (H)
Pin 4	Heater (H)	Heater (H)

Pin	Configuration A	Configuration B
Pin 5	Plate (P)	Plate (P)
Pin 6	Grid No. 2 (G_2)	Grid No. 2 (G_2)
Pin 7	Grid No. 3 (G_3) / Internal Shield (S_i)	Cathode (K)

Because of this variation, circuit designers and technicians must verify the specific tube construction or socket wiring to ensure that the cathode and suppressor grid/shield connections are not reversed.

Heater Ratings and Automotive Operation

The heater of the 12AC6 is designed to withstand the wide voltage fluctuations characteristic of automotive electrical systems. While its nominal rating is 12.6 Volts, the heater is engineered to operate reliably over a broad range to accommodate battery charging and discharging cycles.

- **Nominal Heater Voltage:** 12.6 Volts (AC or DC)
- **Nominal Heater Current:** 0.15 Ampere (150 mA)
- **Permissible Automotive Service Range:** 10.0 to 15.9 Volts

This wide operating range ensures stable receiver performance under varying battery conditions without requiring external voltage regulation for the heater circuit.

Electrical Characteristics and Typical Operation

The 12AC6 is optimized for low-voltage Class A1 amplification. Under typical operating conditions, Grid No. 1 bias is developed via contact potential across a high-value grid resistor, and Grid No. 3 is tied directly to the cathode at the socket.

Typical Operating Conditions (Class A1 Amplifier)

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.15 A
- **Plate Voltage:** 12.6 V
- **Grid No. 2 (Screen Grid) Voltage:** 12.6 V
- **Grid No. 3 (Suppressor Grid) Voltage:** 0 V (connected to cathode)
- **Grid No. 1 (Control Grid) Resistor:** 2.2 MΩ (developing average contact potential)
- **Plate Current:** 550 µA
- **Grid No. 2 Current:** 200 µA
- **Plate Resistance (approx.):** 0.5 MΩ
- **Transconductance (G_1 to Plate):** 730 µmhos (730 µA/V)

Remote Cut-Off Control Characteristics

The remote cut-off characteristic allows the tube to handle a wide range of signal amplitudes without severe distortion, making it highly suitable for automatic volume control (AVC) or automatic gain control (AGC) circuits.

- **Grid No. 1 Voltage for Low Transconductance:** To reduce transconductance (G_m) to approximately 10 µmhos (with $E_{[c3](/tubes/C3)} = 0$ V), a Grid No. 1 bias of approximately **-5.2 Volts** is required.
- **Grid No. 3 Control Option:** Alternatively, if Grid No. 1 is maintained at 0 V (with a 2.2 MΩ grid resistor), the transconductance can be reduced to 10 µmhos by applying a negative bias of approximately **-3.7 Volts** to Grid No. 3.

Maximum Ratings

The maximum ratings of the 12AC6 are established under the Design Center System. Operating the tube beyond these limits may impair its performance or shorten its operational life.

Parameter	Maximum Rating
Plate Voltage	30 Volts
Grid No. 2 (Screen Grid) Voltage	30 Volts
Heater-Cathode Voltage	±30 Volts
Cathode Current	20 mA
Grid No. 1 Circuit Resistance	10 MΩ (Note: Some specifications restrict this to 2.2 MΩ max)

Direct Interelectrode Capacitances

The 12AC6 features low internal capacitances, which can be further minimized by utilizing an external physical shield (such as Shield No. 316).

Capacitance Parameter	Without Shield	With Shield / External Screen
Grid No. 1 to Plate (max)	0.005 pF	0.004 pF
Input Capacitance	4.3 pF	4.3 pF
Output Capacitance	5.0 pF	5.0 pF

Analysis of Characteristic Curves

The qualitative behavior of the 12AC6 is illustrated through its plate and transfer characteristic curves:

Plate Current vs. Plate Voltage ($E_f = 12.6\ \text{V}, E_{c2} = 12.6\ \text{V}$)

- At zero control grid bias ($E_{[c1](/tubes/C1)} = 0\ \text{V}$), the plate current rises sharply as plate voltage increases from 0 V to approximately 5–10 V. Beyond this "knee," the current levels off, rising very gradually from about 0.9–1.25 mA at 10–15 V to approximately 1.3–1.4 mA at 50 V. This flat region indicates a very high plate resistance.
- As the control grid voltage ($E_{[c1](/tubes/C1)}$) is made incrementally more negative (from -0.5 V down to -4.0 V), the plate current curves saturate at progressively lower levels. The knees of these curves become lower and flatter (for example, at $E_{[c1](/tubes/C1)} = -1.0\ \text{V}$, the plate current saturates flatly at approximately 0.45 mA above a plate voltage of 10 V).

Transfer Characteristics ($E_f = 12.6\ \text{V}, E_{c2} = 12.6\ \text{V}, E_b = 12.6\ \text{V}$)

- **Transconductance (G_m) vs. Grid Voltage:** At $E_{[c1](/tubes/C1)} = 0\ \text{V}$, the transconductance peaks at approximately 900 µmhos. As the grid voltage becomes more negative, G_m falls smoothly and continuously, dropping to about 100 µmhos at $E_{[c1](/tubes/C1)} = -2.2\ \text{V}$ to $-2.5\ \text{V}$, and asymptotically approaching zero near $-5\ \text{V}$ to $-6\ \text{V}$. This smooth, extended decay is the signature of a remote cut-off (vari-mu) design.
- **Plate Current (I_b) vs. Grid Voltage:** The plate current tracks the transconductance curve closely. Starting at approximately 0.8 to 1.5 mA at $E_{[c1](/tubes/C1)} = 0\ \text{V}$ (depending on the presence and value of an external grid bias resistor), the plate current decreases smoothly as negative bias increases, reaching near-zero values in the range of $-5\ \text{V}$ to $-7\ \text{V}$.

Technical Summary

The **12AC6** is a specialized **miniature remote cut-off pentode** designed for low-voltage RF and IF amplification in automotive receivers. Operating directly from a nominal **12.6 V** battery supply, it eliminates the need for high-voltage power generation in mobile applications. It features a **T-5 1/2 glass envelope**, a **7-pin miniature base**, and a heater designed to tolerate supply variations from **10.0 V to 15.9 V**.

With a typical transconductance of **730 µmhos** and a plate resistance of **0.5 MΩ** at a plate and screen potential of 12.6 V, the 12AC6 provides stable, low-distortion amplification. Its remote cut-off characteristic enables effective gain control, while its low grid-to-plate capacitance (down to **0.004 pF** with shielding) ensures stable high-frequency operation. Designers must remain cognizant of the documented pinout variations on Pins 2 and 7 to ensure correct circuit implementation.

SOURCE OPERATING CONDITIONS

1958 Brimar Radio Valve No 7

SOURCE PDF

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

1958 BRIMAR RADIO VALVE NO 7

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	**PUBLISHED VALUE**	**CONDITION / NOTE**
Heater Voltage	**12.6 V**	—
Heater Current	**150 mA**	—

SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1961 Tung Sol

SOURCE PDF

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**
Plate Voltage	**12.6 V**	ClassA
Screen Voltage	**12.6 V**	ClassA
Plate Current	**550 uA**	ClassA
Screen Current	**200 uA**	ClassA
Max Imum Heater–Cathode Voltage	**130 V**	—
Max Imum Plate Voltage	**30 V**	—
Max Imum Cathode Current	**20 mA**	—
P Ef =	**12.6 V**	—
A Ecy =	**12.6 V**	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ef =	**12.6 V**	—
Eb =	**12.6 V**	—

CAPACITANCE

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid to Plate	**0.005 pF**	—
Input Capacitance	**4.3 pF**	—
Output Capacitance	**5 pF**	—

SOURCE OPERATING CONDITIONS

1966 Tung Sol Electronic Tubes 2 of 4

SOURCE PDF

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
Plate voltage	**12.6 V**	ClassA1;RFIF
Grid 2 voltage	**12.6 V**	ClassA1;RFIF
Plate current	**0.55 mA**	ClassA1;RFIF
Grid 2 current	**0.2 mA**	ClassA1;RFIF

CHARACTERISTIC

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid 1 voltage for 10 µS transconductance	**-5.2 V**	ClassA1;RFIF
Grid 3 voltage for 10 µS transconductance	**-3.7 V**	ClassA1;RFIF

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

© 2026 Tube Tinker