



ELECTRONIC TUBE REFERENCE

12BX6

Voltage - Pentode High Frequency (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Nine-pin miniature pentode designed for RF, IF, video-amplifier, or mixer service in television receivers. Its broad high-frequency signal role makes it a versatile television front-end and wideband amplification tube rather than a power-output device.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
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	650000 Ω
TRANSCONDUCTANCE	0.0068 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM SCREEN DISSIPATION	0.7 W
MAXIMUM CATHODE CURRENT	15 mA
Published maximum ratings and characteristics promoted from supplied datasheet.	

12BX6 — Miniature RF and Video Pentode

The **12BX6** is a 9-pin miniature pentode designed primarily for use as a radio frequency (R.F.) amplifier, intermediate frequency (I.F.) amplifier, video amplifier, or mixer in television receivers. It features a

coated unipotential cathode and is housed in a standard T-6½ glass envelope. Except for its heater ratings, the 12BX6 is electrically and physically identical to the [3BX6](#).

Physical Construction, Heater, and Pinout

The 12BX6 is constructed in a compact 9-pin miniature configuration. It can be operated in any mounting position.

Physical Dimensions

- **Maximum Overall Length:** 2⅝ inches (2.625 in)
- **Maximum Seated Height:** 2⅜ inches (2.375 in)
- **Maximum Bulb Diameter:** ⅞ inch (0.875 in)
- **Bulb Type:** T-6½ glass

Heater Characteristics

The tube features an indirectly heated, coated unipotential cathode. The heater is designed for operation from either an AC or DC supply.

- **Heater Voltage:** 12.6 V
- **Heater Current:** 0.15 A

Basing and Pin Connections

The 12BX6 uses the **9A0** bottom-view basing arrangement. The pin connections are assigned as follows:

Pin Number	Element Connection
1	Cathode
2	Grid No. 1 (Control Grid)
3	Cathode
4	Heater
5	Heater
6	Internal Shield
7	Plate
8	Grid No. 2 (Screen Grid)
9	Grid No. 3 (Suppressor Grid)

The dual cathode pin connections (Pin 1 and Pin 3) allow for low-inductance cathode connections, which are critical for high-frequency performance.

Maximum Ratings

The maximum ratings for the 12BX6 are established under the **Design Center System**. These limits must not be exceeded under the worst-case operating conditions.

Parameter	Rating	Unit
Maximum Plate Voltage (Without Current)	550	V
Maximum Plate Voltage	250	V
Maximum Plate Dissipation	2.5	W
Maximum Grid No. 2 Voltage (With Cold Cathode)	550	V
Maximum Grid No. 2 Voltage	250	V
Maximum Grid No. 2 Dissipation	0.7	W
Maximum Grid No. 2 Dissipation (at Plate Dissipation < 1.8 W)	0.9	W
Maximum Cathode Current	15	mA
Maximum Grid No. 1 Circuit Resistance	1	MΩ
Maximum Voltage Between Cathode and Heater	150	V
Maximum Circuit Resistance Between Cathode and Heater	20,000	Ω

Typical Operating Conditions and Characteristics

The 12BX6 can be operated under various plate and screen voltages. The typical characteristics as an R.F. amplifier are documented at three distinct operating points:

Parameter	Point A	Point B	Point C	Unit
Heater Voltage	12.6	12.6	12.6	V
Heater Current	0.15	0.15	0.15	A
Plate Voltage	170	200	250	V

Parameter	Point A	Point B	Point C	Unit
Grid No. 3 Voltage	0	0	0	V
Grid No. 2 Voltage	170	200	250	V
Grid No. 1 Voltage	-2.0	-2.55	-3.5	V
Plate Current	10	10	10	mA
Grid No. 2 Current	2.5	2.6	2.8	mA
Transconductance	7,400	7,100	6,800	μmhos
Plate Resistance	0.5	0.55	0.65	$\text{M}\Omega$
Amplification Factor (Grid No. 2 wrt Grid No. 1)	50	50	50	—
Equivalent Noise Resistance	1,000	1,100	1,200	Ω
Input Resistance at 50 Mc (<i>Pin 1 connected to Pin 3</i>)	10,000	12,000	15,000	Ω

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 12BX6, measured without an external shield, are as follows:

- **Grid No. 1 to all other elements except Anode:** 7.5 μpF
- **Plate to all other elements except Grid No. 1:** 3.3 μpF
- **Plate to Grid No. 1 (Max.):** 0.007 μpF
- **Plate to Cathode (Max.):** 0.012 μpF
- **Grid No. 2 to all other elements:** 5.4 μpF
- **Grid No. 2 to Grid No. 1:** 2.6 μpF
- **Grid No. 1 to Heater (Max.):** 0.15 μpF

- **Cathode to Heater:** 5 μF

Application and Circuit Considerations

High-Frequency Input Resistance

At high frequencies, input loading becomes a significant factor. When operating the 12BX6 at 50 Mc, connecting Pin 1 directly to Pin 3 (the two cathode pins) helps minimize internal lead inductance. Under these conditions, the input resistance ranges from **10,000 Ω** (at 170 V plate/screen) up to **15,000 Ω** (at 250 V plate/screen).

Microphonic Prevention in Video Amplifiers

When the 12BX6 is utilized as a video amplifier in television receivers, care must be taken to avoid microphonic feedback. To prevent microphonic effects, the voltage amplification between the input grid of the 12BX6 and the input of the cathode-ray tube (CRT) must be restricted. Specifically, this stage gain should not exceed a maximum value of **25**.

Technical Summary

The **12BX6** is a versatile 9-pin miniature pentode designed for high-frequency television receiver applications, including R.F., I.F., and video amplification, as well as mixer service. Operating with a 12.6 V, 0.15 A heater, it is identical to the [3BX6](#) except for its heater ratings. Under the Design Center System, it supports a maximum plate voltage of 250 V and a plate dissipation of 2.5 W. At typical operating points, it provides high transconductance (up to 7,400 μmhos) and a high grid-to-screen amplification factor of 50. When implemented in video amplifier circuits, the stage gain to the CRT input must be kept below 25 to mitigate microphonics, while its dual cathode pinout allows designers to minimize input loading at high frequencies by tying Pin 1 and Pin 3 together.



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	170200250 V	Typical operating conditions
Screen voltage	170200250 V	Typical operating conditions
Plate current	101010 mA	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

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
GRID #1 TO ALL	0 pF	Published datasheet; operating column 1
GRID #1 TO ALL	7.5 pF	Published datasheet; operating column 2
GRID #2 TO ALL	0 pF	Published datasheet; operating column 1
GRID #2 TO ALL	5.4 pF	Published datasheet; operating column 2
GRID #2 TO GRID #1	2.6 pF	Published datasheet

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
PLATE TO ALL	0 pF	Published datasheet; operating column 1
PLATE TO ALL	3.3 pF	Published datasheet; operating column 2
CATHODE TO HEATER	5 pF	Published datasheet
MAXIMUM PLATE VOLTAGE WITHOUT CURRENT	550 V	Published datasheet
MAXIMUM PLATE VOLTAGE	250 V	Published datasheet
MAXIMUM PLATE DISSIPATION	2.5 W	Published datasheet
MAXIMUM GRID #2 VOLTAGE WITH COLD CATHODE	550 V	Published datasheet
MAXIMUM GRID #2 VOLTAGE	250 V	Published datasheet
MAXIMUM GRID #2 DISSIPATION	0.7 W	Published datasheet
MAXIMUM GRID #2 DISSIPATION AT PLATE DISSIPATION <	1.8 W	Published datasheet; operating column 1
MAXIMUM GRID #2 DISSIPATION AT PLATE DISSIPATION <	0.9 W	Published datasheet; operating column 2
MAXIMUM GRID #1 CIRCUIT RESISTANCE	1 Mohm	Published datasheet
MAXIMUM VOLTAGE BETWEEN CATHODE AND HEATER	150 V	Published datasheet
MAXIMUM CIRCUIT RESISTANCE BETWEEN CATHODE AND HEATER	20 ohm	Published datasheet; operating column 1
MAXIMUM CIRCUIT RESISTANCE BETWEEN CATHODE AND HEATER	0 ohm	Published datasheet; operating column 2
T RANSDUCTANCE]	400 uS	Published datasheet; operating column 1
T RANSDUCTANCE]	6800 uS	Published datasheet; operating column 2
EQUIVALENT NOISE RESISTANCE 1000 li00 IZ00	0 ohm	Published datasheet
Maximum screen voltage	250 V	Published datasheet; promoted section value
Maximum screen dissipation	0.7 W	Published datasheet; promoted section value

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HEATER VOLTAGE	12.6 V	Published datasheet
HEATER VOLTAGE	1 V	Published datasheet; operating column 1
HEATER VOLTAGE	6 V	Published datasheet; operating column 2

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
HEATER CURRENT	0 mA	Published datasheet; operating column 1
HEATER CURRENT	150 mA	Published datasheet; operating column 2
HEATER CURRENT	15 A	Published datasheet; operating column 3
GRID #} VOLTAGE	0 V	Published datasheet; operating column 1
GRID #2 VOLTAGE	1 V	Published datasheet; operating column 1
GRID #2 VOLTAGE	0 V	Published datasheet; operating column 2
GRID #i VOLTAGE -Z	0 V	Published datasheet; operating column 1
GRID #i VOLTAGE -Z	55 V	Published datasheet; operating column 2
GRID #i VOLTAGE -Z	3.5 V	Published datasheet; operating column 3
PLATE RESISTANCE	0.5 Mohm	Published datasheet; operating column 1
PLATE RESISTANCE	0.55 Mohm	Published datasheet; operating column 2
PLATE RESISTANCE	0.65 Mohm	Published datasheet; operating column 3

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