



ELECTRONIC TUBE REFERENCE

1AB6

Voltage Pentode or Tetrode (under 100V) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

HEPTODE

Battery or receiving-tube frequency converter combining local-oscillator and mixer action for superheterodyne radio service. Its multi-grid structure provides frequency conversion while minimizing component count and, in battery types, filament power.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7DH	BASE PINS	7
NOMINAL HEATER	1.4 V / 25 mA	PARALLEL HEATER	– / –
HEATING	Direct	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Heptode	
PLATE RESISTANCE	900000 Ω
TRANSCONDUCTANCE	0.000275 S
MAXIMUM PLATE VOLTAGE	90 V
MAXIMUM SCREEN VOLTAGE	90 V
MAXIMUM PLATE DISSIPATION	0.15 W
MAXIMUM SCREEN DISSIPATION	0.03 W
MAXIMUM CATHODE CURRENT	2.6 mA
<i>Pentagrid converter. Transconductance is conversion transconductance.</i>	

1AB6 — Directly Heated Miniature Pentagrid

Converter

The **1AB6** (also designated as **IAB6** or **DK96**) is a directly heated miniature heptode, or pentagrid converter, designed primarily for frequency changer service in battery-operated radio receivers. It features a low-drain, coated filament designed for efficient direct-current (DC) operation, allowing it to be powered from series or parallel filament supplies.

Construction, Filament, and Physical Dimensions

The 1AB6 is constructed in a miniature glass envelope with a standard 7-pin miniature button base (B7G). The tube is designed to operate in any mounting position.

The physical dimensions of the tube are compact, making it suitable for portable equipment:

- **Maximum overall length:** 54.5 mm (2-5/32 inches) or 2.205 inches
- **Maximum seated height:** 47.5 mm (1-7/8 inches) or 1.955 inches
- **Bulb length (excluding tip):** 1.580 inches $\pm$ 0.094 inches
- **Maximum diameter:** 19 mm (3/4 inch)

The filament is coated and optimized for low power consumption. It can be operated under two different supply configurations:

- **Series Supply:** Nominal filament voltage of 1.3 V at a current of 24 mA.
- **Parallel Supply:** Nominal filament voltage of 1.4 V at a current of 25 mA (0.025 A).
- **Filament Voltage Limits:** The permissible filament voltage ranges from a minimum of 1.1 V to a maximum of 1.6 V.

Pinout and Electrode Connections

The 1AB6 uses the **7DH** basing arrangement. Viewed from the underside of the base, the pin connections are assigned as follows:

Pin Number	Electrode Connection
1	Filament negative (-)
2	Anode (Plate)
3	Grid No. 2 (Oscillator Anode / g_2)
4	Grid No. 1 (Oscillator Grid / g_1)
5	Grid No. 4 (Screen Grid / g_4)
6	Grid No. 3 (Control Grid / g_3)
7	Filament positive (+) and Grid No. 5 (Suppressor Grid / g_5)

Absolute Maximum Ratings

The following maximum ratings are established under the Design Center and Design-Maximum rating systems. These limits must not be exceeded to ensure reliable operation and longevity of the tube:

Parameter	Design Center Limit	Absolute Permissible Limit
Maximum Battery Voltage	90 V	110 V
Maximum Plate (Anode) Voltage	90 V	—
Maximum Grid No. 4 (Screen) Voltage	90 V	—
Maximum Grid No. 2 (Oscillator Anode) Voltage	60 V	—
Maximum Plate Dissipation	0.15 W	—
Maximum Grid No. 2 Dissipation	0.1 W	—
Maximum Grid No. 4 Dissipation	0.03 W	—
Maximum Cathode Current	2.6 mA	—
Maximum Grid No. 3 Circuit Resistance	3.0 MΩ	—
Maximum Grid No. 1 Circuit Resistance	0.1 MΩ	—
Maximum Grid No. 3 Voltage ($I_{g3} = +0.3 \mu\text{A}$)	+1.0 V	—
Maximum Grid No. 1 Voltage ($I_{g1} = +0.3 \mu\text{A}$)	0 V	—

Typical Operating Points and Converter Service

In typical frequency changer (converter) service, the 1AB6 operates with separate excitation and no impedance in the Grid No. 2 lead. The operating characteristics are documented at two primary supply levels (64 V and 85 V), which are typically derived from standard battery voltages decreased by the negative bias of the receiver's output stage.

Parameter	64 V Supply	85 V Supply
Anode (Plate) Voltage	64 V	85 V

Parameter	64 V Supply	85 V Supply
Grid No. 4 (Screen) Voltage	64 V	64 V to 68 V (approx.)
Grid No. 4 Feed Resistor	0 Ω	120 k Ω (0.12 M Ω)
Grid No. 3 (Control Grid) Voltage	0 V	0 V
Grid No. 2 (Oscillator Anode) Voltage	35 V	35 V (approx.)
Grid No. 2 Feed Resistor	18,000 Ω	33,000 Ω
Grid No. 1 A.C. Signal Voltage	4 V (r.m.s.)	4 V (r.m.s.)
Grid No. 1 Resistor (to Filament +)	27,000 Ω	27,000 Ω
Plate Current	0.55 to 0.6 mA	0.6 to 0.65 mA
Grid No. 4 Current	0.12 to 0.16 mA	0.14 to 0.17 mA
Grid No. 2 Current	1.6 mA	1.5 mA
Grid No. 1 Current	85 μ A	85 μ A
Total Cathode Current	2.45 mA	2.4 mA
Conversion Conductance (g_c)	275 μ hos	300 μ hos
Plate Resistance (r_p)	0.75 to 0.9 M Ω	0.8 to 1.0 M Ω
Grid No. 3 Bias for 100:1 g_c Reduction	-4.5 V	-6.5 V
Conversion Conductance at Cutoff Bias	2.75 μ hos (at -4.5 V)	3.0 μ hos (at -6.5 V)

Oscillator Section Characteristics

The characteristics of the oscillator portion of the heptode are evaluated with Grid No. 1 connected directly to the positive side of the filament:

- **Plate Voltage:** 64 V or 85 V
- **Grid No. 4 Voltage:** 64 V
- **Grid No. 3 Voltage:** 0 V
- **Grid No. 2 (Oscillator Anode) Voltage:** 35 V
- **Grid No. 2 Current:** 1.7 mA
- **Mutual Conductance (g_1 to g_2):** 0.6 mA/V (600 μ hos)

- **Amplification Factor (μ_{g1-g2}):** 7.5

Interelectrode Capacitances

The interelectrode capacitances of the 1AB6, measured without an external shield, are detailed below:

- **Plate to all other electrodes (C_{a-all}):** 8.1 pF to 8.4 pF
- **Grid No. 3 to all other electrodes (C_{g3-all}):** 7.4 pF to 7.6 pF
- **Grid No. 2 to all other electrodes (C_{g2-all}):** 4.8 pF
- **Grid No. 1 to all other electrodes (C_{g1-all}):** 3.9 pF
- **Plate to Grid No. 3 (C_{a-g3}):** maximum 0.36 pF
- **Plate to Grid No. 2 (C_{a-g2}):** maximum 0.3 pF
- **Plate to Grid No. 1 (C_{a-g1}):** maximum 0.11 pF
- **Grid No. 2 to Grid No. 3 (C_{g2-g3}):** 1.6 pF
- **Grid No. 1 to Grid No. 3 (C_{g1-g3}):** maximum 0.2 pF
- **Grid No. 1 to Grid No. 2 (C_{g1-g2}):** 3.0 pF

Qualitative Performance and Curve Interpretation

The performance curves of the 1AB6 reveal several key operational behaviors:

- **Control Grid (Grid No. 3) Bias Effects:** Both plate current and conversion conductance decrease smoothly as the Grid No. 3 bias becomes more negative. The plate current drops in a semi-logarithmic fashion. Applying higher Grid No. 4 (screen) voltages (ranging from 30 V to 90 V) shifts both the plate current and conversion conductance curves upward and to the left, requiring a more negative bias to achieve cutoff.
- **Oscillator Voltage Effects:** At a supply voltage of 85 V, the conversion conductance peaks when the oscillator voltage is between 4 V and 5 V r.m.s. Below this range, conversion efficiency drops; above it, the conversion conductance decreases slightly. The plate resistance of the tube increases gradually as the oscillator voltage rises, while the Grid No. 1 current increases in an almost linear relationship with the oscillator voltage.

Technical Summary

The **1AB6** is a highly efficient, directly heated miniature pentagrid converter designed for battery-operated receivers. Operating with a low-drain filament (1.4 V, 25 mA), it combines a mixer and oscillator in a single 7-pin miniature envelope. Under typical operating conditions with an 85 V supply, it provides a conversion conductance of 300 μ mhos and a high plate resistance of up to 1.0 M Ω , while maintaining a total cathode current draw of only 2.4 mA. This makes it an exceptionally optimized frequency changer for portable radio applications.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X General Electric Essential Characteristics

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

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	64 V	Converter
Screen voltage	64 V	Converter
Grid voltage	0 V	Converter
Plate current	0.6 mA	Converter
Screen current	0.16 mA	Converter
Oscillator current	85 uA	Converter
Oscillator grid resistor	27000 ohm	Converter
Oscillator plate voltage	35 V	Converter
Oscillator plate series resistor	18000 ohm	Converter
Oscillator plate current	1.6 mA	Converter

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Ferranti Technical Handbook

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

1961 FERRANTI TECHNICAL HANDBOOK

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Battery frequency changer	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Oscillator anode voltage maximum	60 V	—
Oscillator grid voltage	4 V	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

1999 Philips 0-D

SOURCE PDF

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

1999 PHILIPS 0-D

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Pin 9 - grid No	4 mA	Pin 9 - grid No.4 max 2.205% "
Plate to grid No	3 mA	Plate to grid No.3 max. 0.36 pyuF
Plate to grid No	2 mA	Plate to grid No.2 max. 0.3 upfF
Plate to grid No	1 mA	Plate to grid No.1 max. C.11 puF
Grid No.1 to grid No	3 mA	Grid No.1 to grid No.3 max. 0.2 pyuF
Battery voltage max	90 V	Battery voltage max. 90 volts1)
Plate voltage max	90 V	Plate voltage max. 90 volts
Plate dissipation max	0.15 watt	Plate dissipation max. 0.15 watt
Grid No	4 V	Grid No.4 voltage max. 90 volts
Grid No	90 V	Grid No.4 voltage max. 90 volts
Grid No.4 dissipation max	0.03 watt	Grid No.4 dissipation max. 0.03 watt
Grid No	2 V	Grid No.2 voltage max. 60 volts
Grid No	60 V	Grid No.2 voltage max. 60 volts

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No.2 dissipation max	0.1 watt	Grid No.2 dissipation max. 0.1 watt
Cathode current max	2.6 mA	Cathode current max. 2.6 ma
Grid No	3 c	Grid No.3 circuit resistance max. 3 megohms
Grid No	3 megohms	Grid No.3 circuit resistance max. 3 megohms
Grid No	1 c	Grid No.1 circuit resistance max. 0.1 megohm
Grid No	1 megohm	Grid No.1 circuit resistance max. 0.1 megohm
Filament voltage max	1.6 V	Filament voltage max. 1.6 volts

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Filament voltage	1.4 V	Filament voltage 1.4 volts
Filament current	25 mA	Filament current 25 m amps
Filament voltage min	1.1 V	Filament voltage min. 1.1 volts
(grid No	1 c	(grid No.1 connected
Plate voltage 64	85 V	Plate voltage 64 85 volts
Grid No	64 V	Grid No.4 voltage 64 64 volts
Grid No	3 V	Grid No.3 voltage 0 0 volt
Grid No	0 V	Grid No.3 voltage 0 0 volt
Grid No	35 V	Grid No.2 voltage 35 35 volts
Grid No	2 c	Grid No.2 current 1.7 1.7 ma
Grid No	1.7 mA	Grid No.2 current 1.7 1.7 ma
grid No	1 w	grid No.1 with respect 600 600 micromhos
grid No	600 μS	grid No.1 with respect 600 600 micromhos
of grid No	2 w	of grid No.2 with Te5 7.5
voltage is	110 V	voltage is 110 volts.
Anode voltage Ly 64	85 V	Anode voltage Ly 64 85 volts
Grid No	64.5 V	Grid No.4 voltage 64 64,5 volts
Grid No.4 resistor 0	0.12 megohm	Grid No.4 resistor 0 0.12 megohm
Grid No.2 resistor 18,000	33 ohms	Grid No.2 resistor 18,000 33,000 ohms
Grid No	1 A	Grid No.1 A.C.voltage 4 4 volts,rms
Grid No.1 resistor 27,000	27 ohms	Grid No.1 resistor 27,000 27,000 ohms 2)
Plate current 0.6 0«	65 mA	Plate current 0.6 0«65 ma
Grid No	4 c	Grid No.4 current 0.16 0.17 ma

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid No	0.17 mA	Grid No.4 current 0.16 0.17 ma
Grid No	1.5 mA	Grid No.2 current 1.6 1.5 ma
Grid No.t current 85	85 pa	Grid No.t current 85 85 pa
Cathode current 2.45	2.4 mA	Cathode current 2.45 2.4 ma
Conversion conductance 275	30 C	Conversion conductance 275 30C micromhos
(grid No	3 V	(grid No.3 voltage = - 3.0 mieromhos
Plate resistance 0.9	1 megohm	Plate resistance 0.9 1.0 megohm
T) Based on a battery voltage of 67.5 or	90 V	T) Based on a battery voltage of 67.5 or 90 volts de-
" voltage	85 V	" voltage=85volts
Grid No2 voltage	35 w	Grid No2 voltage=35volts §
Oscillator voltage	4 w	Oscillator voltage=4wolls rms. $V_g // /) / \%$
§ S Plate voltage	85 V	§ S Plate voltage =85volts b
g 4 Grid No4 resistor	0.12 megohm	g 4 Grid No4 resistor=0.12megohm