TRIODE-HEPTODE for use in F.M., AM/FM, A.M. and television receivers

PHYSICAL SPECIFICATIONS
Cathode Coated unipotential
Base Small button noval 9-pin
Maximum overall length 2 5/8 inches
Maximum seated height 2 3/8 inches
Bulb length excluding tip 2+3/32 inches
Maximum diameter 7/8 inch
Mounting position Any
Basing connections - JETEC basing designation 9 CA

Pin 1 - Heptode grids No.2 and 4
Pin 2 - Heptode grid No.1
Pin 3 - Cathode,heptode grid No.5 and internal shield
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Heptode plate
Pin 7 - Heptode grid No.3
Pin 8 - Triode plate
Pin 9 - Triode grid

GENERAL ELECTRICAL DATA
Heater voltage 6.3 volts
Heater current 0.3 ampere

Direct interelectrode capacitances

| Heptode section | Grid No.1 to all other elements | 4.8 μF |
| Grid No.3 to all other elements | 5.8 μF |
| Plate to all other elements | 7.9 μF |
| Plate to grid No.1 | max. 0.01 μF |
| Grid No.1 to grid No.3 | max. 0.3 μF |
| Grid No.1 to heater | max. 0.1 μF |
| Grid No.3 to heater | max. 0.08 μF |

4.4.1952
N.V. PHILIPS' GLOEILAMPENFABRIKEN, Eindhoven, Holland.
### Direct interelectrode capacitances (continued)

**Triode section**
- Grid to all other elements: 2.7 μF
- Plate to all other elements: 2.3 μF
- Plate to grid: 1.0 μF
- Grid to heater: max. 0.02 μF

**Between triode and heptode sections**
- Heptode plate to triode plate: 0.22 μF
- Heptode plate to triode grid: max. 0.09 μF
- Heptode grid to triode plate: max. 0.06 μF
- Heptode grid to triode grid: max. 0.17 μF
- Heptode grid to triode grid + heptode grid No.3: max. 0.45 μF
- Heptode plate to triode grid + heptode grid No.3: max. 0.35 μF

### Maximum ratings (design center values)

**Triode section**
- Plate voltage: 300 volts
- Plate voltage (without current): 550 volts
- Plate dissipation: 1.7 watts
- Grids No.2 and 4 voltage: 125 volts
- Grids No.2 and 4 voltage (plate current less than 1 mamp): 300 volts
- Grids No.2 and 4 voltage (without current): 550 volts
- Grids No.2 and 4 dissipation: 1 watt
- Cathode current: 12.5 mamps
- Grid No.1 circuit resistance: 3 megohms
- Grid No.3 circuit resistance: 3 megohms
- Grid No.1 current starting point (grid No.1 voltage at grid No.1 current = +0.3μamp) = -1.3 volts
- Grid No.3 current starting point (grid No.3 voltage at grid No.3 current = +0.3μamp) = -1.3 volts
- External resistance between heater and cathode: 20,000 ohms
- Voltage between heater and cathode: 100 volts

*Standard deviation = 0.015 μF, which means that for 68% of a great number of tubes this capacitance lies between 0.22 - 0.015 μF and 0.22 + 0.015 μF.*
Maximum ratings (design center values; continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triode section</td>
<td></td>
</tr>
<tr>
<td>Plate voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Plate voltage (without current)</td>
<td>550 volts</td>
</tr>
<tr>
<td>Plate dissipation</td>
<td>0.8 watts</td>
</tr>
<tr>
<td>Cathode current</td>
<td>6.5 mamps</td>
</tr>
<tr>
<td>Grid circuit resistance</td>
<td>3 megarms</td>
</tr>
<tr>
<td>Grid current starting point</td>
<td></td>
</tr>
<tr>
<td>at grid current = +0.3 μamp</td>
<td>-1.3 volts</td>
</tr>
<tr>
<td>External resistance between heater and cathode</td>
<td>20,000 ohms</td>
</tr>
<tr>
<td>Voltage between heater and cathode</td>
<td>100 volts</td>
</tr>
</tbody>
</table>

Operating characteristics of the heptode section as mixer. Triode grid connected to heptode grid No.3

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Plate voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Grids No.2 and 4 series resistor</td>
<td>22,000 ohms</td>
</tr>
<tr>
<td>Oscillator grid leak</td>
<td>47,000 ohms</td>
</tr>
<tr>
<td>Oscillator grid current</td>
<td>200 μamps</td>
</tr>
<tr>
<td>Grid No.1 bias</td>
<td>-2, -28.5 volts</td>
</tr>
<tr>
<td>Plate current</td>
<td>3.25 mamps</td>
</tr>
<tr>
<td>Grids No.2 and 4 current</td>
<td>6.7 mamps</td>
</tr>
<tr>
<td>Conversion conductance</td>
<td>775 7.75 micromhos</td>
</tr>
<tr>
<td>Plate resistance</td>
<td>3 megarms</td>
</tr>
<tr>
<td>Equivalent noise resistance</td>
<td>70,000 ohms</td>
</tr>
</tbody>
</table>

Note - The 6AJ8 as frequency changer can be used in combination with the 6BY7 as I.F. amplifier with a common screen grid resistor of 18,000 ohms and in combination with the 6N8 as I.F. amplifier with a common screen grid resistor of 22,000 ohms.

The 6AJ8 as H.F. or I.F. amplifier can be used in combination with the 6BY7 with a common screen grid resistor of 22,000 ohms.
Operating characteristics of the heptode section as H.F. or I.F. amplifier

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Plate voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Grid No.3 voltage</td>
<td>0 volt</td>
</tr>
<tr>
<td>Grids No.2 and 4 series resistor</td>
<td>39,000 ohms</td>
</tr>
<tr>
<td>Grid No.1 bias</td>
<td>-2 -42 volts</td>
</tr>
<tr>
<td>Grids No.2 and 4 voltage</td>
<td>102 volts</td>
</tr>
<tr>
<td>Plate current</td>
<td>6.5 m amps</td>
</tr>
<tr>
<td>Grids No.2 and 4 current</td>
<td>3.8 m amps</td>
</tr>
<tr>
<td>Transconductance</td>
<td>2400 24 micromhos</td>
</tr>
<tr>
<td>Plate resistance</td>
<td>0.7 &gt;10 megohms</td>
</tr>
<tr>
<td>Amplification factor of grid No.2 with respect to grid No.1</td>
<td>20 -</td>
</tr>
<tr>
<td>Equivalent noise resistance</td>
<td>8500 ohms</td>
</tr>
<tr>
<td>Input damping at 100 Mc</td>
<td>1600 ohms</td>
</tr>
</tbody>
</table>

Operating characteristics for use as A.F. amplifier

The heptode section of this tube can be used as A.F. amplifier without special precautions against microphonic effect in circuits in which the input voltage is 50 millivolts at least for an output of 50 milliwatts of the output tube.

The corresponding value for the triode section is 25 millivolts.

On page 19 and 20 curves are shown for the use of the triode section as resistance coupled A.F. amplifier. The output voltage and the distortion have been measured at the grid current starting point. At smaller input voltages the distortion is proportionally smaller.

Typical characteristics of the triode section

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate voltage</td>
<td>100 volts</td>
</tr>
<tr>
<td>Grid bias</td>
<td>0 volt</td>
</tr>
<tr>
<td>Plate current</td>
<td>13.5 m amps</td>
</tr>
<tr>
<td>Transconductance</td>
<td>3700 micromhos</td>
</tr>
<tr>
<td>Amplification factor</td>
<td>22</td>
</tr>
</tbody>
</table>

Operating characteristics of the triode section as oscillator

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>Plate series resistor</td>
<td>33,000 ohms</td>
</tr>
<tr>
<td>Oscillator grid leak</td>
<td>47,000 ohms</td>
</tr>
<tr>
<td>Oscillator grid current</td>
<td>200 μ amps</td>
</tr>
<tr>
<td>Plate current</td>
<td>4.5 m amps</td>
</tr>
<tr>
<td>Effective transconductance</td>
<td>550 micromhos</td>
</tr>
</tbody>
</table>

N.V. PHILIPS' GLOEILAMPFABRIEKEN, Eindhoven, Holland.
Frequency changer
Plate voltage = 250 volts
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 200 microamps

Supply voltage = 250 volts
Grid No 2 & 4 resistor = 22,000 ohms

Grid No 1 bias (volts)

Plate current (micro-amps)
Frequency changer
Plate voltage = 250 volts
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 200 microamps

Supply voltage = 250 volts
Grid No. 2 & 4 resistor = 22,000 ohms
Frequency changer
Supply voltage = 250 volts
Plate voltage = 250 volts
Grid No.2 & 4 series resistor = 22000 ohms
Oscillator grid resistor = 42000 ohms
Oscillator grid current = 200 microamps
Frequency changer
Supply voltage = 250 volts
Plate voltage = 250 volts
Grid No 2 & 4 resistor = 22,000 ohms
Oscillator grid resistor = 47,000 ohms
Grid No 1 bias = -2 volts
Frequency changer
Supply voltage = 250 volts
Plate voltage = 250 volts
Grid No. 2 & 4 resistor = 22,000 ohms
Oscillator grid resistor = 47,000 ohms
Oscillator grid current = 200 micro-amps

Cross modulation = 1 percent
Hum modulation = 1 percent

Conversion conductance (micromhos)
6AJ8 PHILIPS

R.F. or I.F. amplifier (heptode section)
Plate voltage = 250 volts
Grid No3 voltage = 0 volt

Supply voltage = 250 volts
Grid No2 & 4 resistor = 39000 ohms

Plate current (micro-amps)

Grid No1 bias (volts)

-80  -60  -40  -20  0  200  400  600  800  1000  10,000
RF or I.F. amplifier (heptode section)
Plate voltage = 250 volts
Grid No.3 voltage = 0 volt

Supply voltage = 250 volts
Grid No.2 & 4 resistor = 39000 ohms

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R.F. or I.F. amplifier (heptode section)
Supply voltage = 250 volts
Plate voltage = 250 volts
Grid No. 2 & 4 series resistor = 3900 ohms
Grid No. 3 voltage = 0 volt

Plate resistance (megohms)
Equivalent noise resistance (megohms)
Plate current
Grid No. 2 & 4 current
Transconductance
Plate resistance
Equivalent noise resistance

Grid No. 1 bias (volts)

1000
10
1
0.1

1000
100
10
1

0.01
0.001
0.1
0

10,000
1000
100
10

10,000
1000
100
10
R.F. or I.F. amplifier (heptode section)
Supply voltage = 250 volts
Plate voltage = 250 volts
Grid No 2 & 4 resistor = 39,000 ohms
Grid No 3 voltage = 0 volt

Cross modulation = 1 percent
Hum modulation = 1 percent
Triode section
Plate voltage = 100 volts

Transconductance (micromhos)

Plate current (milliamps)

Grid No1 bias (volts)
Triode section as oscillator
Supply voltage = 250 volts
Plate series resistor = 33,000 ohms
Grid resistor = 47,000 ohms

Oscillator voltage = 250 volts
Plate current = 10 milliamps
Effective slope (microamps)
Triode section
Self oscillating frequency changer
Supply voltage=250volts
Plate series resistor=33,000ohms
Grid No 1 resistor=1megohm

[Diagram with axes labeled as follows:
- Plate current (milliamperes)
- Grid No 1 current (microamperes)
- Plate resistance (ohms)
- Plate conductance (microhms)
- Transconductance (T.F.)
- Conversion conductance
- Plate current (milliamperes)
- Oscillator voltage (volts, R.M.S.)]
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Output voltage (volts, R.M.S.)

Plate current (milliamperes)

Voltage gain

Output voltage

Distortion

Grid bias (volts)

Triode section as A.F. amplifier
Supply voltage = 250 volts
Plate series resistor = 0.1 megohm

Voltage gain; Distortion (percents)