TRIODE-HEXODE FREQUENCY CONVERTER

GENERAL DATA
Cathode  Coated unipotential
Base Small-button Noval 9-pin
Bulb T6\(^1\)/\(^2\)
Mounting position Any

Basing Connections
Pin 1 - Hexode grids No.2, No.4.
Pin 2 - Hexode grid No.1
Pin 3 - Cathode, internal shield
Pin 4 - Heater
Pin 5 - Heater
Pin 6 - Internal connection
Pin 7 - Hexode plate
Pin 8 - Triode plate
Pin 9 - Triode grid No.1, hexode grid No.3

GENERAL ELECTRICAL DATA
Heater voltage 6.3 volts
Heater current 0.3 amp

Direct Interelectrode Capacitances
Hexode grid No.1 to all other electrodes 3.8 \(\mu\)F
Hexode plate to all other electrodes 9.2 \(\mu\)F
Hexode grid No.1 to hexode plate max. 0.1 \(\mu\)F
Hexode grid No.1 to heater max. 0.15 \(\mu\)F
Cathode to triode grid, hexode grid No.3 5.6 \(\mu\)F
Cathode to triode plate 2.4 \(\mu\)F
Triode plate to triode grid, hexode grid No.3 1.4 \(\mu\)F
Hexode grid No.1 to triode grid, hexode grid No.3 max. 0.35 \(\mu\)F
Hexode plate to triode grid, hexode grid No.3 max. 0.2 \(\mu\)F

MAXIMUM RATINGS (Design-Centre Values)

Hexode Section
Plate voltage (without current) 550 volts
Plate voltage 300 volts
Plate dissipation 1.5 watts
Grid No.2, No.4 voltage (without current) 550 volts
Grid No.2, No.4 voltage (plate current less than 1 mA) 300 volts
Grid No.2, No.4 dissipation 125 volts
Grid No.2, No.4 dissipation (grid current 3 mA) 125 volts
Grid No.1 voltage at grid No.1 current = +0.3 \(\mu\)A -1.3 volts

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Cathode current 10 mA
External grid No.1 resistance 3 megohms
External grid No.3 resistance 3 megohms
External heater-cathode resistance 20,000 ohms
Heater-cathode voltage 100 volts

Triode Section
Plate voltage(without current) 550 volts
Plate voltage 175 volts
Plate dissipation 0.8 watts
Grid No.1 voltage at grid No.1 current = + 0.3 µA - 1.3 volts
Cathode current 6 mA
External grid resistance 3 megohms
External heater-cathode resistance 20,000 ohms
Heater-cathode voltage 100 volts

TYPICAL CHARACTERISTICS
Triode Section
Plate voltage 100 volts
Grid voltage 0 volts
Plate current 10 mA
Mutual conductance 2500 µmhos
Amplification factor 22

TYPICAL OPERATING CONDITIONS
Triode Section as Oscillator
Supply voltage 250 250 volts
Plate resistor 33,000 33,000 ohms
Grid resistor 47,000 22,000 ohms
Grid current 200 350 µA
Plate current 4.8 5.1 mA
R.M.S. oscillator voltage 8.0 8.0 volts
Effective mutual conductance 550 600 µmhos

Hexode Section

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<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexode plate and supply voltage</td>
<td>250 volts</td>
</tr>
<tr>
<td>$R_1$ (see circuit diagram)</td>
<td>27,000 ohms</td>
</tr>
<tr>
<td>$R_2$ (see circuit diagram)</td>
<td>27,000 ohms</td>
</tr>
<tr>
<td>Cathode resistor</td>
<td>180 ohms</td>
</tr>
<tr>
<td>Grid No. 3, triode grid resistor</td>
<td>22,000 ohms</td>
</tr>
<tr>
<td>Grid No. 3, triode grid current</td>
<td>350 μA</td>
</tr>
<tr>
<td>Grid No. 1 voltage</td>
<td>-2 volts</td>
</tr>
<tr>
<td>Grid No. 2, No. 4 voltage</td>
<td>85 volts</td>
</tr>
<tr>
<td>Plate current</td>
<td>3.0 mA</td>
</tr>
<tr>
<td>Grid No. 2, No. 4 current</td>
<td>3.0 mA</td>
</tr>
<tr>
<td>Conversion conductance</td>
<td>750 μmhos</td>
</tr>
<tr>
<td>Plate resistance</td>
<td>min. 1.0 megohm</td>
</tr>
<tr>
<td>Equivalent noise resistance</td>
<td>100,000 ohms</td>
</tr>
<tr>
<td>Grid No. 1 voltage for C.01 of</td>
<td></td>
</tr>
<tr>
<td>nominal conversion conductance</td>
<td></td>
</tr>
<tr>
<td>with grid No. 2, No. 4 voltage = 124 V</td>
<td>-29 volts</td>
</tr>
</tbody>
</table>

**NOTES**

1. With an alternative value of grid No. 3, triode grid resistor of 47,000 ohms, the grid current should be adjusted to 200 μA.
$V_a = 250\, \text{V}$
$R_{(gT+g3)} = 47\, \text{k}\Omega$
$I_{(gT+g3)} = 200\, \mu\text{A}$

or

$V_a = 250\, \text{V}$
$R_{(gT+g3)} = 22\, \text{k}\Omega$
$I_{(gT+g3)} = 350\, \mu\text{A}$

$V_b = 250\, \text{V}$
$R_1 = 27\, \text{k}\Omega$
$R_2 = 27\, \text{k}\Omega$
$V_n = 250 \, V$

$R_{(g_T + g_3)} = 47 \, k\Omega$

$I_{(g_T + g_3)} = 200 \, \mu A$

or

$V_a = 250 \, V$

$R_{(g_T + g_3)} = 22 \, k\Omega$

$I_{(g_T + g_3)} = 350 \, \mu A$

$V_b = 250 \, V$

$R_1 = 27 \, k\Omega$

$R_2 = 27 \, k\Omega$

$v_{g_2 + g_4} = 160 \, V$

130V

100V

90V

40V

-40 $V_{g1}(V)$

-30

-20

-10

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$$V_a = 250V$$
$$V_b = 250V$$
$$R_1 = 27\, k\Omega$$
$$R_2 = 27\, k\Omega$$
$$R_{(gT+g3)} = 47\, k\Omega$$ \hspace{1cm} \text{or} \hspace{1cm} 22\, k\Omega$$
$$I_{(gT+g3)} = 200\mu A$$ \hspace{1cm} \text{or} \hspace{1cm} 350\mu A$$

$K = 1\%$

$mb = 1\%$
\[ V_a = V_b = 250 \text{ V} \]
\[ R_1 = 27 \text{ k}\Omega \]
\[ R_2 = 27 \text{ k}\Omega \]
\[ R(g_T+g_3) = 47 \text{ k}\Omega \]
\[ V_{g1} = -2 \text{ V} \]
$V_a = V_b = 250 \, V$
$R_1 = 27 \, k\Omega$
$R_2 = 27 \, k\Omega$
$R(g_T+g_3) = 22 \, k\Omega$
$V_{g1} = -2 \, V$
V_b = 250 V
R_{A_T} = 33 k\Omega
R_{(g_T+g_3)} = 47 k\Omega

I_{a_T}, \text{ eff. } g_m (m A) (m A/V)
10^{-2}, 2.5

V_{osc} (V_{rms})
25

I_a
15

I_{(g_T+g_3)} (\mu A)
0

0 100 200 300

55911

11.1965
$V_b = 250\,V$
$R_aT = 33\,k\Omega$
$R_{(gT+g3)} = 22\,k\Omega$

$V_{osc}$

$I_{aT}$

$\frac{I_{aT}}{(mA)}$

$\frac{g_m}{(mA/V)}$

$10^{-}$

$2.5$

$8.2$

$2.0.5$

$4.1$

$6.1,5$

$15$

$10$

$5$

$0$

$200$

$400$

$600$

$I_{(gT+g3)}\,(\mu A)$

$0$

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