OUTPUT PENTODE

Output pentode primarily intended for use as line time base output valve in A.C. television receivers.

HEATER

\[ V_h = 6.3 \, \text{V} \]
\[ I_h = 1.4 \, \text{A} \]

CAPACITANCES

\[ C_{1n} = 18 \, \mu\text{F} \]
\[ C_{out} = 8.0 \, \mu\text{F} \]
\[ C_{a-g1} < 1.2 \, \mu\text{F} \]

CHARACTERISTICS

\[ V_a = 275 \, \text{V} \]
\[ V_{g2} = 275 \, \text{V} \]
\[ I_a = 91 \, \text{mA} \]
\[ I_{g2} = 11 \, \text{mA} \]
\[ V_{g1} = -9 \, \text{V} \]
\[ g_m = 14 \, \text{mA/V} \]
\[ \mu_{g1-g2} = 16.5 \]
\[ r_a = 20 \, \text{k}\Omega \]

OPERATION AS LINE OUTPUT PENTODE

Circuit Design

To allow for valve spread and for deterioration during life the line output stage should be designed around the following values:—

\[ V_a = 90 \, \text{V} \]
\[ V_{g2} = 275 \, \text{V} \]
\[ I_a = 150 \, \text{mA} \]

For the average new valve the following figures will apply:—

\[ V_a = 90 \, \text{V} \]
\[ V_{g2} = 275 \, \text{V} \]
\[ V_{g1} = -1 \, \text{V} \]
\[ I_a = 225 \, \text{mA} \]

Typical Circuit

(See circuit on page 3)

\[ V_b = 300 \, \text{V} \]
\[ I_a = 64 \, \text{mA} \]
\[ I_{g2} = 18 \, \text{mA} \]
\[ R_k = 120 \, \Omega \]
\[ I_a = 0.8 \, \text{mA} \]

N.B.—Above figures measured under synchronised conditions.

LIMITING VALUES

\[ V_{a \ (b) \ max.} = 1.2 \, \text{kV} \]
\[ V_a \ max. = 800 \, \text{V} \]
\[ v_a \ (pk) \ max. = 8 \, \text{kV} \]
\[ V_{g2 \ (b) \ max.} = 800 \, \text{V} \]
\[ V_{g2} \ max. = 400 \, \text{V} \]
\[ p_a \ max. = 25 \, \text{W} \]
\[ p_{g2} \ max. = 8 \, \text{W} \]
\[ I_a \ max. = 200 \, \text{mA} \]
\[ V_{g1} \ max. \ (I_{g1} = +0.3 \, \mu A) = -1.3 \, \text{V} \]
\[ R_{g1-k} \ max. \ (p_a < 25W) = 500 \, \text{k}\Omega \]
\[ R_{g1-k} \ max. \ (p_a < 9 \, \text{W}) = 800 \, \text{k}\Omega \]
\[ V_{h-k} \ max. = 100 \, \text{V} \]
\[ R_{h-k} \ max. = 20 \, \text{k}\Omega \]
**CIRCUIT VALUES** (see circuit on page 3)

**Resistors**

<table>
<thead>
<tr>
<th>Resistor</th>
<th>Value</th>
<th>Wattage</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_1$</td>
<td>47 kΩ</td>
<td>$\frac{1}{2}$ W</td>
<td>20%</td>
</tr>
<tr>
<td>$R_2$</td>
<td>330 kΩ</td>
<td>$\frac{1}{4}$ W</td>
<td>10%</td>
</tr>
<tr>
<td>$R_3$</td>
<td>50 kΩ</td>
<td>1 W</td>
<td>Potentiometer</td>
</tr>
<tr>
<td>$R_4$</td>
<td>680 Ω</td>
<td>$\frac{1}{2}$ W</td>
<td>10%</td>
</tr>
<tr>
<td>$R_5$</td>
<td>820 kΩ</td>
<td>$\frac{1}{4}$ W</td>
<td>20%</td>
</tr>
<tr>
<td>$R_6$</td>
<td>120 Ω</td>
<td>1 W</td>
<td>20%</td>
</tr>
<tr>
<td>$R_7$</td>
<td>500 Ω</td>
<td>4 W</td>
<td>Potentiometer</td>
</tr>
<tr>
<td>$R_8$</td>
<td>2.2 kΩ</td>
<td>$\frac{1}{4}$ W</td>
<td>20%</td>
</tr>
<tr>
<td>$R_9$</td>
<td>2.5 kΩ</td>
<td>4 W</td>
<td>Potentiometer</td>
</tr>
<tr>
<td>$R_{10}$</td>
<td>2.7 kΩ</td>
<td>4 W</td>
<td>20%</td>
</tr>
<tr>
<td>$R_{11}$</td>
<td>100 Ω</td>
<td>$\frac{1}{4}$ W</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Capacitors**

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Value</th>
<th>Tolerance</th>
<th>Wkg. Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_1$</td>
<td>0.1 μF</td>
<td>20%</td>
<td>350 V</td>
</tr>
<tr>
<td>$C_2$</td>
<td>0.0022 μF</td>
<td>20%</td>
<td>350 V</td>
</tr>
<tr>
<td>$C_3$</td>
<td>0.01 μF</td>
<td>10%</td>
<td>350 V</td>
</tr>
<tr>
<td>$C_4$</td>
<td>0.001 μF</td>
<td>10%</td>
<td>350 V</td>
</tr>
<tr>
<td>$C_5$</td>
<td>0.004–0.006 μF</td>
<td>—</td>
<td>500 V</td>
</tr>
</tbody>
</table>

**Transformers**

- **T1** Ratio 1 : 3 (step-up into grid circuit)
- **T2** Ratio 4 : 1 primary inductance $\leq 1$ H

**Deflector Coils**

- Resistance: 3 Ω
- Inductance: 6.5 mH

To provide full scan for 9" picture tube ($V_{as}=7 kV$) with peak to peak current swing of 500 mA.

**Notes**

(i) Synchronising pulses may be applied negatively to the anode or positively to the grid of the EBC33.

(ii) The decoupling components ($R_1 C_1$) in the anode circuit of the EBC33 are necessary only if there is ripple on the H.T. line.

(iii) All potentiometers should be linear components to provide smooth control.
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LINE TIME BASE CIRCUIT

OCTAL BASE
EL38

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ANOQUE CURRENT AND SCREEN-GRID CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER