TELEVISION TUBE

A28-14W

TENTATIVE DATA

QUICK REFERENCE DATA

28cm (11in) rectangular direct viewing television tube with metal backed screen and reinforced envelope. A separate safety screen is not required. Especially for use in portable receivers with push-through presentation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflection angle</td>
<td>90 deg</td>
</tr>
<tr>
<td>Focusing</td>
<td>Electrostatic</td>
</tr>
<tr>
<td>Light transmission</td>
<td>55 %</td>
</tr>
<tr>
<td>Maximum overall length</td>
<td>25 cm</td>
</tr>
</tbody>
</table>

This data should be read in conjunction with

GENERAL OPERATIONAL RECOMMENDATIONS - CATHODE RAY TUBES

HEATER

\[ V_h \]
\[ I_h \]

The heater supply circuit should provide a nominal voltage of 11V, either d.c. or a.c.

For supply from a.c. mains, see General Operational Recommendations - Cathode Ray Tubes.

For supply direct from a battery, the heater voltage cycle must be within the limits of the graph on page C1. In any discharge cycle, the time of \( V_h \) above 13V must not exceed 30 minutes.

OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{a2+a4} ) (focus electrode control range)</td>
<td>0 to 350 V</td>
</tr>
<tr>
<td>( V_{a3} ) (focus electrode control range)</td>
<td>250 V</td>
</tr>
<tr>
<td>( V_g ) for visual extinction of focused raster</td>
<td>-35 to -69 V</td>
</tr>
<tr>
<td>( V_k ) for visual extinction of focused raster</td>
<td>approx. 45 V</td>
</tr>
</tbody>
</table>

*For cathode modulation, all voltages are measured with respect to grid.
SCREEN

Metal backed
Fluorescent colour White
Light transmission (approx.) 55 %
Useful screen area see page D7

FOCUSING

Electrostatic

The range of focus voltages shown in 'OPERATING CONDITIONS' results in optimum overall focus at a beam current of 100µA.

DEFLECTION

Double magnetic

The deflection coils should be designed so that their internal contour is in accordance with the reference line gauge shown on page D10.

CAPACITANCES

<table>
<thead>
<tr>
<th>Capacitance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_{g \text{-} all}$</td>
<td>7.0 pF</td>
</tr>
<tr>
<td>$C_{k \text{-} all}$</td>
<td>3.0 pF</td>
</tr>
<tr>
<td>$C_{a2+a4-M}$</td>
<td>550 to 850 pF</td>
</tr>
<tr>
<td>$C_{a2+a4-B}$</td>
<td>150 pF</td>
</tr>
</tbody>
</table>

EXTERNAL CONDUCTIVE COATING

This tube has an external conductive coating, $M$, which must be connected to chassis, and the capacitance of this coating to the final anode is used to provide smoothing for the e.h.t. supply. The electrical connection to this coating must be made within the area specified on the tube outline drawing.

RASTER CENTRING

See notes under this heading in 'General Operational Recommendations - Cathode Ray Tubes'.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centring magnet field intensity</td>
<td>0 to 10 Gs</td>
</tr>
<tr>
<td>Maximum distance of centre of centring field from reference line</td>
<td>55 mm</td>
</tr>
</tbody>
</table>

Adjustment of the centring magnet should not be such that a general reduction in brightness of the raster occurs.

REFERENCE LINE GAUGE see page D10
TELEVISION TUBE

QUICK REFERENCE DATA

28cm (11in) rectangular direct viewing television tube with metal back-
ed screen and reinforced envelope. A separate safety screen is not
required. Especially for use in portable receivers with push-through
presentation.

<table>
<thead>
<tr>
<th>Deflection angle</th>
<th>90  deg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focusing</td>
<td>Electrostatic</td>
</tr>
<tr>
<td>Light transmission</td>
<td>50  %</td>
</tr>
<tr>
<td>Maximum overall length</td>
<td>250  mm</td>
</tr>
</tbody>
</table>

This data should be read in conjunction with GENERAL OPERATIONAL
RECOMMENDATIONS - TELEVISION PICTURE TUBES

HEATER

\[
\begin{align*}
V_h & = 11 \text{ V} \\
I_h & = 68 \text{ mA}
\end{align*}
\]

The heater supply circuit should provide a nominal voltage of 11V, either
d.c. or a.c.
For supply from a.c. mains, see General Operational Recommendations -
Television Picture Tubes.
For supply direct from a battery, the heater voltage cycle must be within
the limits of the graph on page 11. In any discharge cycle, the time of \( V_h \)
above 13V must not exceed 30 minutes.

OPERATING CONDITIONS

\[
\begin{align*}
V_{a2+a4} & = 11 \text{ kV} \\
V_{a3} & = \text{focus electrode control range} \quad 0 \text{ to } 350 \text{ V} \\
V_{a1} & = 250 \text{ V} \\
V_{g} & = \text{for visual extinction of focused raster} \quad -35 \text{ to } -69 \text{ V} \\
V_{k} & = \text{for visual extinction of focused raster} \quad \text{approx. } 45 \text{ V}
\end{align*}
\]

*For cathode modulation, all voltages are measured with respect to grid.
SCREEN

Metal backed
Fluorescent colour White
Light transmission (approx.) 50 %
Useful screen area see page 7

FOCUSING

Electrostatic
The range of focus voltages shown in 'OPERATING CONDITIONS' results in optimum overall focus at a beam current of 100μA.

DEFLECTION

Magnetic
Diagonal deflection angle 90 deg
Horizontal deflection angle 80 deg
Vertical deflection angle 63 deg
The deflection coils should be designed so that their internal contour is in accordance with the reference line gauge shown on page 10.

CAPACITANCES

\[
\begin{align*}
&c_{g-all} & 7.0 & \text{pF} \\
&c_{k-all} & 3.0 & \text{pF} \\
&c_{a2+a4-M} & 550 \text{ to } 850 & \text{pF} \\
&c_{a2+a4-B} & 150 & \text{pF}
\end{align*}
\]

EXTERNAL CONDUCTIVE COATING

This tube has an external conductive coating, M, which must be connected to chassis, and the capacitance of this coating to the final anode is used to provide smoothing for the e.h.t. supply. The electrical connection to this coating must be made within the area specified on the tube outline drawing.

RASTER CENTRING

See notes under this heading in 'General Operational Recommendations - Television Picture Tubes'.

- Centring magnet field intensity 0 to 800 A/m
- Maximum distance of centre of centring field from reference line 55 mm

Adjustment of the centring magnet should not be such that a general reduction in brightness of the raster occurs.

REFERENCE LINE GAUGE see page 10
TELEVISION TUBE

MOUNTING POSITION

The tube socket should not be rigidly mounted but should have flexible leads and be allowed to move freely.

This tube is fitted with a pin protector in order to avoid damage to the glass base due to bending of the base pins whilst handling the tube.

It is advisable to keep this pin protector on the base until it can be replaced by the socket after the installation of the tube in any equipment.

RATINGS (DESIGN CENTRE SYSTEM unless otherwise stated)

\[
\begin{align*}
V_{a2+a4} &\text{ max. (at } \frac{I_{a2+a4}}{I_{a2+a4}} = 0 \text{) (see note 1)} & 12 & \text{kV} \\
V_{a2+a4} &\text{ min. (absolute limit)} & 7.5 & \text{kV} \\
V_{a3} &\text{ max.} & 500 & \text{V} \\
V_{a3} &\text{ min.} & 50 & \text{V} \\
V_{a1} &\text{ max.} & 350 & \text{V} \\
V_{a1} &\text{ min.} & 200 & \text{V} \\
V_{g(pk)} &\text{ max. (see note 2)} & 350 & \text{V} \\
V_{g} &\text{ max. (see note 3)} & 100 & \text{V} \\
I_{a3} &\text{ max.} & 25 & \text{µA} \\
I_{a1} &\text{ max.} & 5.0 & \text{µA} \\
V_{h-k} &\text{ d.c. max.} & 110 & \text{V} \\
pk &\text{ max.} & 130 & \text{V} \\
R_{h-k} &\text{ max.} & 1.0 & \text{MΩ} \\
Z_{k-e} &\text{ max. (f = 50Hz)} & 100 & \text{kΩ} \\
R_{g-k} &\text{ max.} & 1.5 & \text{MΩ} \\
Z_{g-k} &\text{ max. (f = 50Hz)} & 500 & \text{kΩ}
\end{align*}
\]

Notes

1. Adequate precautions should be taken to ensure that the receiver is protected from damage which may be caused by a possible high voltage flashover within the tube.

2. Maximum pulse duration 22\% of one cycle with a maximum of 1.5ms.
3. The d.c. value of bias must not be such as to allow the grid to become positive with respect to the cathode, except during the period immediately after switching the receiver on or off when it may be allowed to rise to +1.0V. It is advisable to limit the positive excursion of the video signal to +5V(pk) max. This may be achieved automatically by the series connection of a 10kΩ resistor.

4. The metal band (B) should be connected directly to the chassis in an a.c. receiver operating from an isolating transformer, or via a suitable leakage path in an a.c./d.c. receiver, for example 2MΩ.

The mounting lugs will be in electrical contact with the metal band.

WEIGHT

| Tube alone (approx.) | 2.2 kg |
TELEVISION TUBE

All dimensions in mm

Determined by the plane of the upper edge of the step on the reference line gauge (page 10) when the gauge is resting on the cone.
Dimensions of metal band

The mounting bolts must lie within circles of 5 dia. centred on the true geometric position of these holes.

Pin dimensions as in B7G base.
The centre of the socket must allow entry of the pump stem.

All dimensions in mm
Dimensions of face

281.5±1.5 (bulb)
262.5 min

171 min

228 min

262.5 min

Minimum useful screen area of spherical face

10.5 ±1.5
6.1 ±1

830 R

171 min

228 min

262.5 min

262.5 min

1.3

25 ±2

0.8

Flat to within 1mm.

All dimensions in mm

B7709

Mould match line

Rim detail

APRIL 1969

Mullard

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MAXIMUM CONE CONTOURS

Nominal distance of plane from point Z.

All dimensions in mm.

Reference line

APRIL 1969

Mullard

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### Dimensions for Maximum Cone Contour Drawing

Distance from Centre

<table>
<thead>
<tr>
<th>Section</th>
<th>(0^\circ) long</th>
<th>(10^\circ)</th>
<th>(20^\circ)</th>
<th>(25^\circ)</th>
<th>(30^\circ)</th>
<th>(34^\circ)</th>
<th>(40^\circ)</th>
<th>(45^\circ)</th>
<th>(50^\circ)</th>
<th>(60^\circ)</th>
<th>(70^\circ)</th>
<th>(80^\circ)</th>
<th>(90^\circ) short</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>130.0</td>
<td>131.6</td>
<td>136.6</td>
<td>140.6</td>
<td>145.5</td>
<td>147.5</td>
<td>144.9</td>
<td>136.8</td>
<td>127.9</td>
<td>114.9</td>
<td>106.8</td>
<td>102.4</td>
<td>101.0</td>
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<tr>
<td>2</td>
<td>127.4</td>
<td>128.9</td>
<td>133.8</td>
<td>137.7</td>
<td>142.4</td>
<td>144.9</td>
<td>141.8</td>
<td>133.3</td>
<td>124.8</td>
<td>112.6</td>
<td>105.2</td>
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<td>99.9</td>
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<td>122.6</td>
<td>126.8</td>
<td>130.4</td>
<td>134.7</td>
<td>137.6</td>
<td>133.9</td>
<td>125.6</td>
<td>118.4</td>
<td>108.2</td>
<td>102.0</td>
<td>99.0</td>
<td>97.9</td>
</tr>
<tr>
<td>4</td>
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<td>115.2</td>
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<td>127.3</td>
<td>124.5</td>
<td>117.5</td>
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<tr>
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<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
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</tr>
</tbody>
</table>

All dimensions in mm
REFERENCE LINE GAUGE

All dimensions in mm
HEATER VOLTAGE PLOTTED AGAINST BATTERY DISCHARGE CYCLE
Grid modulation

$V_{a2+a4} = 7.5$ to $12$ kV

$V_{al} = 250$ V

**Final anode current plotted against grid voltage**

**Grid modulation**

**A28-14W**

**B7705 I_{a2+a4} (mA)**

$V_g (V)$

$-40$ $-30$ $-20$ $-10$ $0$

$0$ $0.2$ $0.4$ $0.6$ $0.8$ $1.0$ $1.2$
FINAL ANODE CURRENT PLOTTED AGAINST CATHODE-TO-GRID VOLTAGE. CATHODE MODULATION
LIMITS OF CATHODE-TO-GRID CUT-OFF VOLTAGE PLOTTED AGAINST FIRST ANODE-TO-GRID VOLTAGE. CATHODE MODULATION.