Television: 1939 Du Mont Model 181

The Model 181 is a high-quality model which provides television and sound, specifically intended for television broadcasting. The black and white picture of the 1930s television was produced on the screen of the 1930s television. The screen is 18 inches in diameter, with 250 black and white television lines. The 250 vertical lines of the picture are scanned with a frequency of 60 Hz, with 30 lines on each of the 150 red, blue, and green power lines. The picture is made of 150 red, blue, and green power lines. Each line, 150 red, blue, and green power lines, is used for the television to produce a picture on the screen. The picture is made of 150 red, blue, and green power lines. Each line, 150 red, blue, and green power lines, is used for the television to produce a picture on the screen.

Vector Displays

Originally black-and-white
60 Hz vertical scan frequency
15.75 kHz horizontal frequency

\[
\frac{15.75 \text{ kHz}}{60 \text{ Hz}} = 262.5 \text{ lines per field}
\]

White 1 V
Black 0.075 V
Blank 0 V
Sync – 0.4 V
A Line of B&W Video

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Interlaced Scanning

Color Television

Color added later: had to be backwards compatible.

Solution: continue to transmit a “black-and-white” signal and modulate two color signals on top of it.

RGB vs. YIQ colorspaces

\[
\begin{bmatrix}
0.30 & 0.59 & 0.11 \\
0.60 & -0.28 & -0.32 \\
0.21 & -0.52 & 0.31
\end{bmatrix}
\begin{bmatrix}
R \\
G \\
B
\end{bmatrix}
= 
\begin{bmatrix}
Y \\
I \\
Q
\end{bmatrix}
\]

Y baseband 4 MHz “black-and-white” signal I as 1.5 MHz, Q as 0.5 MHz at 90°; modulated at 3.58 MHz
### International Standards

<table>
<thead>
<tr>
<th>lines</th>
<th>active</th>
<th>vertical</th>
<th>aspect</th>
<th>horiz.</th>
<th>frame</th>
<th>rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTSC</td>
<td>525</td>
<td>484</td>
<td>242</td>
<td>4:3</td>
<td>427</td>
<td>29.94 Hz</td>
</tr>
<tr>
<td>PAL</td>
<td>625</td>
<td>575</td>
<td>290</td>
<td>4:3</td>
<td>425</td>
<td>25 Hz</td>
</tr>
<tr>
<td>SECAM</td>
<td>625</td>
<td>575</td>
<td>290</td>
<td>4:3</td>
<td>465</td>
<td>25 Hz</td>
</tr>
</tbody>
</table>

PAL: Uses YUV instead of YIQ, flips phase of V every other line

SECAM: Transmits the two chrominance signals on alternate lines; no quadrature modulation

### Computer Video: VGA

#### Detailed VGA Timing

- **640 × 480, 60 Hz**
  - 25.175 MHz Dot Clock
  - 31.469 kHz Line Frequency
  - 59.94 Hz Field Frequency

<table>
<thead>
<tr>
<th>pixels</th>
<th>role</th>
<th>lines</th>
<th>role</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Front Porch</td>
<td>2</td>
<td>Front Porch</td>
</tr>
<tr>
<td>36</td>
<td>Horizontal Sync</td>
<td>2</td>
<td>Vertical Sync</td>
</tr>
<tr>
<td>40</td>
<td>Back Porch</td>
<td>25</td>
<td>Back Porch</td>
</tr>
<tr>
<td>8</td>
<td>Left border</td>
<td>8</td>
<td>Top Border</td>
</tr>
<tr>
<td>640</td>
<td>Active</td>
<td>480</td>
<td>Active</td>
</tr>
<tr>
<td>8</td>
<td>Right border</td>
<td>8</td>
<td>Bottom Border</td>
</tr>
</tbody>
</table>

Active-low Horizontal and Vertical sync signals.

### VGA Timing

<table>
<thead>
<tr>
<th>Mode</th>
<th>Resolution</th>
<th>Vertical</th>
<th>Horizontal</th>
<th>Pixel Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGA</td>
<td>640 × 480</td>
<td>70 Hz</td>
<td>31.5 kHz</td>
<td>25.175 MHz</td>
</tr>
<tr>
<td>VGA</td>
<td>640 × 640</td>
<td>70 Hz</td>
<td>31.5 kHz</td>
<td>25.175 MHz</td>
</tr>
<tr>
<td>VGA</td>
<td>800 × 600</td>
<td>56 Hz</td>
<td>35.2 kHz</td>
<td>36 MHz</td>
</tr>
<tr>
<td>VGA</td>
<td>800 × 640</td>
<td>60 Hz</td>
<td>37.8 kHz</td>
<td>40 MHz</td>
</tr>
<tr>
<td>VGA</td>
<td>800 × 720</td>
<td>72 Hz</td>
<td>48.8 kHz</td>
<td>50 MHz</td>
</tr>
<tr>
<td>XGA</td>
<td>1024 × 768</td>
<td>60 Hz</td>
<td>48.5 kHz</td>
<td>65 MHz</td>
</tr>
<tr>
<td>SXGA</td>
<td>1280 × 1024</td>
<td>61 Hz</td>
<td>64.2 kHz</td>
<td>110 MHz</td>
</tr>
<tr>
<td>HDTV</td>
<td>1920 × 1080</td>
<td>60 Hz</td>
<td>75 kHz</td>
<td>162 MHz</td>
</tr>
<tr>
<td>UXGA</td>
<td>1600 × 1200</td>
<td>85 Hz</td>
<td>105.77 kHz</td>
<td>220 MHz</td>
</tr>
<tr>
<td>WUXGA</td>
<td>1920 × 1200</td>
<td>70 Hz</td>
<td>87.5 kHz</td>
<td>230 MHz</td>
</tr>
</tbody>
</table>

- **DDC1**
  - ID2 Data from display

- **DDC2**
  - ID1 I²C SDA
  - ID3 I²C SLC

Active-low Horizontal and Vertical sync signals.