

6 Video

6.1 Overview

HDMI allows any video format timing to be transmitted and displayed. To maximize interoperability between products, common DTV formats have been defined. These video format timings define the pixel and line counts and timing, synchronization pulse position and duration, and whether the format is interlaced or progressive. HDMI also allows vendor-specific formats to be used.

The video pixels carried across the link shall be in one of three different pixel encodings: RGB 4:4:4, YC_BC_R 4:4:4 or YC_BC_R 4:2:2.

The HDMI Source determines the pixel encoding and video format of the transmitted signal based on the characteristics of the source video, the format and pixel encoding conversions possible at the Source, and the format and pixel encoding capabilities and preferences of the Sink.

6.2 Video Format Support

In order to provide maximum compatibility between video Sources and Sinks, specific minimum requirements have been specified for Sources and Sinks.

6.2.1 **Format Support Requirements**

Some of the following support requirements are in addition to those specified in EIA/CEA-861B.

- An HDMI Source shall support at least one of the following video format timings:
 - 640x480p @ 59.94/60Hz
 - 720x480p @ 59.94/60Hz
 - 720x576p @ 50Hz
- An HDMI Source that is capable of transmitting any of the following video format timings using any other component analog or uncompressed digital video output, shall be capable of transmitting that video format timing across the HDMI interface.
 - 1280x720p @ 59.94/60Hz
 - 1920x1080i @ 59.94/60Hz
 - 720x480p @ 59.94/60Hz
 - 1280x720p @ 50Hz
 - 1920x1080i @ 50Hz
 - 720x576p @ 50Hz
- An HDMI Sink that accepts 60Hz video formats shall support the 640x480p @ 59.94/60Hz and 720x480p @ 59.94/60Hz video format timings.
- An HDMI Sink that accepts 50Hz video formats shall support the 640x480p @ 59.94/60Hz and 720x576p @ 50Hz video format timings.

- An HDMI Sink that accepts 60Hz video formats, and that supports HDTV capability, shall support 1280x720p @ 59.94/60Hz or 1920x1080i @ 59.94/60Hz video format timings.
- An HDMI Sink that accepts 50Hz video formats, and that supports HDTV capability, shall support 1280x720p @ 50Hz or 1920x1080i @ 50Hz video format timings.
- An HDMI Sink that is capable of receiving any of the following video format timings using any other component analog or uncompressed digital video input, shall be capable of receiving that format across the HDMI interface.
 - 1280x720p @ 59.94/60Hz
 - 1920x1080i @ 59.94/60Hz
 - 1280x720p @ 50Hz
 - 1920x1080i @ 50Hz

6.2.2 Video Control Signals : HSYNC, VSYNC

During the Data Island period, HDMI carries HSYNC and VSYNC signals using encoded bits on Channel 0. During Video Data periods, HDMI does not carry HSYNC and VSYNC and the Sink should assume that these signals remain constant. During Control periods, HDMI carries HSYNC and VSYNC signals through the use of four different control characters on TMDS Channel 0.

6.2.3 Pixel Encoding Requirements

Only pixel encodings of RGB 4:4:4, YC_BC_R 4:2:2, and YC_BC_R 4:4:4 (as specified in Section 6.5) may be used on HDMI.

All HDMI Sources and Sinks shall be capable of supporting RGB 4:4:4 pixel encoding.

All HDMI Sources shall support either YC_BC_R 4:2:2 or YC_BC_R 4:4:4 pixel encoding whenever that device is capable of transmitting a color-difference color space across any other component analog or digital video interface except where that device would be required to convert RGB video to YC_BC_R in order to meet this requirement.

All HDMI Sinks shall be capable of supporting both YC_BC_R 4:4:4 and YC_BC_R 4:2:2 pixel encoding when that device is capable of supporting a color-difference color space from any other component analog or digital video input.

If an HDMI Sink supports either YC_BC_R 4:2:2 or YC_BC_R 4:4:4 then both shall be supported.

An HDMI Source may determine the pixel-encodings that are supported by the Sink through the use of the E-EDID. If the Sink indicates that it supports YC_BC_R-formatted video data and if the Source can deliver YC_BC_R data, then it can enable the transfer of this data across the link.

6.3 Video Format Timing Specifications

All specified video line pixel counts and video field line counts (both active and total) and HSYNC and VSYNC positions, polarities, and durations shall be adhered to when transmitting a specified video format timing.

For example, if a Source is processing material with fewer active pixels per line than required (i.e. 704 pixels vs. 720 pixels for standard definition MPEG2 material), it may add pixels to the left and

right of the supplied material before transmitting across HDMI. AVI bar info may need to be adjusted to account for these added pixels.

Detailed timing is found in EIA/CEA-861B or a later version of CEA-861B for the following video format timings.

6.3.1 Primary Video Format Timings

- 640x480p @ 59.94/60Hz
- 1280x720p @ 59.94/60Hz
- 1920x1080i @ 59.94/60Hz
- 720x480p @ 59.94/60Hz
- 720(1440)x480i @ 59.94/60Hz
- 1280x720p @ 50Hz
- 1920x1080i @ 50Hz
- 720x576p @ 50Hz
- 720(1440)x576i @ 50Hz

6.3.2 Secondary Video Format Timings

- 720(1440)x240p @ 59.94/60Hz
- 2880x480i @ 59.94/60Hz
- 2880x240p @ 59.94/60Hz
- 1440x480p @ 59.94/60Hz
- 1920x1080p @ 59.94/60Hz
- 720(1440)x288p @ 50Hz
- 2880x576i @ 50Hz
- 2880x288p @ 50Hz
- 1440x576p @ 50Hz
- 1920x1080p @ 50Hz
- 1920x1080p @ 23.98/24Hz
- 1920x1080p @ 25Hz
- 1920x1080p @ 29.97/30Hz
- 2880x480p @ 59.94/60Hz
- 2880x576p @ 50Hz
- 1920x1080i (1250 total) @ 50Hz
- 720(1440)x480i @ 119.88/120Hz
- 720x480p @ 119.88/120Hz
- 1920x1080i @ 119.88/120Hz
- 1280x720p @ 119.88/120Hz

- 720(1440)x480i @ 239.76/240Hz
- 720x480p @ 239.76/240Hz
- 720(1440)x576i @ 100Hz
- 720x576p @ 100Hz
- 1920x1080i @ 100Hz
- 1280x720p @ 100Hz
- 720(1440)x576i @ 200Hz
- 720X576p @ 200Hz

6.4 Pixel-Repetition

Video formats with native pixel rates below 25 Mpixels/sec require pixel-repetition in order to be carried across a TMDS link. 720x480i and 720x576i video format timings shall always be pixel-repeated.

The HDMI Source indicates the use of pixel-repetition with the Pixel Repetition (PR0:PR3) field in the AVI InfoFrame. This field indicates to the HDMI Sink how many repetitions of each unique pixel are transmitted. In non-repeated formats, this value is zero.

For pixel-repeated formats, this value indicates the number of pixels that may be discarded by the Sink without losing real image content.

The Source shall always accurately indicate the pixel repetition count being used. The use of the Pixel Repetition field is optional for HDMI Sink.

The use of this pixel-repetition count field is more fully described in EIA/CEA-861B.

6.5 Pixel Encodings

There are three different pixel encodings that may be sent across an HDMI cable: $YCbCr$ 4:4:4, $YCbCr$ 4:2:2 and RGB 4:4:4. Whichever encoding is used, it shall conform to one of the methods described in this section.

Figure 6-1 shows the default encoding, RGB 4:4:4. The R, G, and B components of the first pixel for a given line of video are transferred on the first pixel of the video data period following the Guard Band characters.

