

for Television — High Data-Rate Serial Data Transport Interface (HD-SDTI)



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1 Scope

This standard provides the mechanisms necessary to facilitate the transport of packetized data over a synchronous data carrier. The HD-SDTI data packets and synchronizing signals provide a data transport interface which is compatible with SMPTE 292M (HD-SDI) such that it can be readily used by the infrastructure provided by this standard.

The standard uses a dual-channel operation where each line carries two data channels each forming an independent HD-SDTI data transport mechanism. The two channels are word-multiplexed onto the HD-SDI stream such that one line-channel occupies the C data space and the other line-channel occupies the Y data space.

The standard provides for a baseline operation which supports a constant payload length per line-channel having a maximum payload data rate up to approximately 1.0 Gb/s. It further provides for an extended operation which supports a variable payload length through the advancement of the SAV sequence to ensure a constant payload data rate regardless of the HD-SDI frame rate.

The HD-SDTI protocol is compatible with SMPTE 305M.

Additional documents shall be used to describe the payloads of particular applications of this standard including details of the data formatting and other parameters such as compression and error correction, if applicable.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

ANSI/SMPTE 125M-1995, Television — Component Video Signal 4:2:2 — Bit-Parallel Digital Interface

SMPTE 291M-1998, Television — Ancillary Data Packet and Space Formatting

SMPTE 292M-1998, Television — Bit-Serial Digital Interface for High-Definition Television Systems

SMPTE 299M-2004, Television — 24-Bit Digital Audio Format for SMPTE 292M Bit-Serial Interface

SMPTE 305M-2005, Television — Serial Data Transport Interface

ITU-T X.25 (10/96), Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit

3 General specifications

This standard describes the assembly of two channels of 10-bit words multiplexed onto one HD-SDI line for the purpose of transporting the data streams in a structured framework. The HD-SDTI data blocks and synchronizing signals provide a data transport protocol which can readily be added to the infrastructure provided by SMPTE 292M.

SMPTE 292M requires a sequence of 10-bit words which define a television horizontal line comprising five areas in the following sequence (note: the first 2 areas are often described together):

- EAV: a 4-word unique timing sequence defining the end of active video (of the previous line);
- LN/CRC: 2 words defining the line number followed by a 2-word CRC error detection code;
- Digital line blanking;
- SAV: a 4-word unique timing sequence defining the start of active video; and
- Digital active line.

An associated television source format standard defines the rate of television horizontal lines by defining the following parameters:

- The number of words per line;
- The number of words in the digital active line (and hence the number of words in the digital line blanking period);
- The number of lines per frame; and
- The number of frames per second.

SMPTE 292M currently defines 3 source format standards (1035, 1080, and 720 active lines per frame). ANSI/SMPTE 125M describes the meaning of the EAV and SAV word sequences which can be applied to all relevant source formats.

A decoder of this standard shall not be required to decode all the source formats available to SMPTE 292M. The source formats which must be supported by the decoder shall be specified in the application document.

3.1 HD-SDTI Mapping onto HD-SDI

The source format in combination with SMPTE 292M provide the bit-serial format formed from C/Y word-multiplexed channels as illustrated in figure 1.

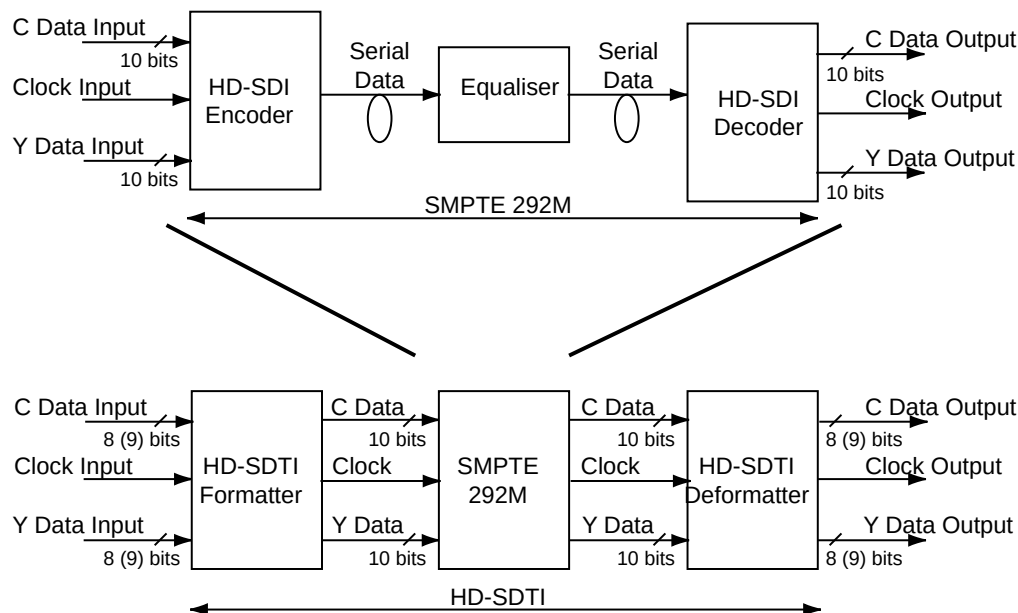


Figure 1 – Arrangement of HD-SDTI wrapped around SMPTE 292M

The HD-SDTI data shall be serialized, scrambled, coded, and interfaced according to SMPTE 292M and the associated source format standard. The signal specifications and connector types shall be as described in SMPTE 292M.

The data word length shall be 10 bits defined as bits B0 through to B9. B0 is the least significant bit (LSB) and B9 is the most significant bit (MSB). The order of bit-transmission shall be LSB first as defined in SMPTE 292M.

Source data shall be in groups of four 10-bit words representing a word-multiplexed C_B , Y_1 , C_R , Y_2 signal, where C_B and C_R form one parallel C-data channel and Y_1 and Y_2 form a second parallel Y-data channel.

The C/Y word clock rate shall be exactly 74.25 MW/s for those picture rates which are an exact integer number per second and shall be 74.25/1.001 MW/s for those picture rates which are offset by a divisor of 1.001.

The bit clock rate shall be 20 times the C/Y word clock rate (i.e. 1.485 Gb/s or 1.485/1.001 Gb/s).

The timing reference signals, EAV and SAV, shall occur on every line and shall be C/Y interleaved as described in the source format document. The line number (LN) and CRC shall occur on every line and shall be C/Y interleaved as described in SMPTE 292M.

The HD-SDTI header data shall be encapsulated by an ancillary data packet according to SMPTE 291M and placed in the data space between the end of the EAV/LN/CRC and the beginning of the SAV.

The HD-SDTI payload shall be placed between the end of the SAV and the beginning of the EAV.

There shall be space for two HD-SDTI header data and payloads per line. The first HD-SDTI header data and payload shall use the C data channel and the second HD-SDTI header data and payload shall use the Y data channel. The two channels shall be word multiplexed according to SMPTE 292M.

Each C/Y multiplexed line is treated as a separate HD-SDTI payload. Any line may carry an HD-SDTI payload on either the C-channel or the Y-channel. Where a line carries both C-channel and Y-channel payloads, the C-channel payload shall be assumed first in time, followed by the Y-channel payload.

Figure 2 shows the data placement of the two HD-SDTI header data and payloads for one line.

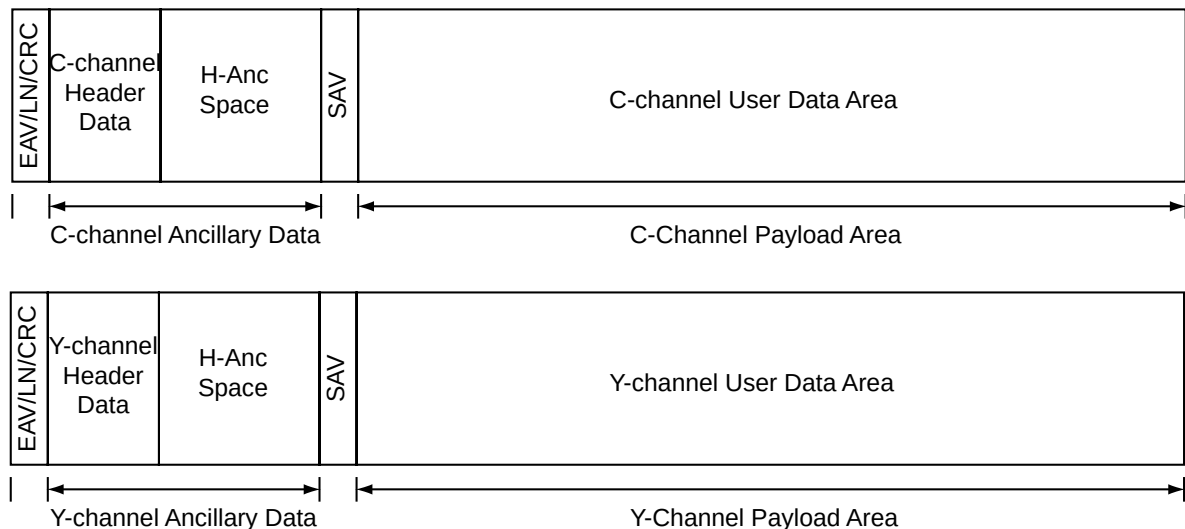


Figure 2 – General layout of the dual-channel HD-SDTI header data and payload

3.2 Extended mode for constant payload data rate

The default HD-SDTI payload for each channel is the defined C/Y digital active line- period for the source format at all picture rates. An optional extension mode allows source formats which would otherwise reduce the payload data rate, to advance the timing of the SAV marker so that the payload data rate remains a constant value. In extended mode, the constant payload data rate value is either exactly 129.6 MB/s or 129.6/1.001 MB/s depending on whether the frame rate of the source format includes a 1.001 divisor. The payload length values associated with particular source formats are given in table 1.

Table 1 – Payload length extension values for varying source frame rates

Frame rate	Total lines per frame	Samples per line	Blanking length	Payload length	Gross (Y+C) payload rate
25	1125	2640	336	2304	129.6 MB/s
24 (24/1.001)	1125	2750	350	2400	129.6 MB/s
60 (60/1.001)	750	1650	210	1440	129.6 MB/s
50	750	1980	252	1728	129.6 MB/s
30 (30/1.001)	750	3300	420	2880	129.6 MB/s
25	750	3960	504	3456	129.6 MB/s
24 (24/1.001)	750	4125	525	3600	129.6 MB/s