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SMPTE STANDARD

for Television — Transport of Alternate Source Image Formats through SMPTE 292M



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1 Scope

This standard specifies the transport of component 525-line interlaced, 525-line progressive, 625-line interlaced, and 625-line progressive scan source formats through SMPTE 292M, the bit-serial digital interface for high-definition television systems.

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

ANSI/SMPTE 259M-1997, Television — 10-Bit 4:2:2 Component and $4f_{sc}$ Composite Digital Signals — Serial Digital Interface

ANSI/SMPTE 267M-1995, Television — Bit-Parallel Digital Interface — Component Video Signal 4:2:2 16×9 Aspect Ratio

ANSI/SMPTE 293M-1996, Television — 720 × 483 Active Line at 59.94-Hz Progressive Scan Production — Digital Representation

ANSI/SMPTE 294M-1997, Television — 720 × 483 Active Line at 59.94-Hz Progressive Scan Production — Bit-Serial Interfaces

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

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

SMPTE 344M-2000, Television — 540-Mb/s Serial Digital Interface

SMPTE 352M-2001, Television — Video Payload Identification for Digital Television Interfaces

SMPTE RP 174-1993, Bit-Parallel Digital Interface for 4:4:4:4 Component Video Signal (Single Link)

ITU-R BT.601-5 (10/95), Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios

ITU-R BT.656-4 (02/98), Interfaces for Digital Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601 (Part A)

ITU-R BT.799-3 (02/98), Interfaces for Digital Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:4:4 Level of Recommendation ITU-R BT.601 (Part A)

ITU-R BT.1358 (02/98), Studio Parameters of 625 and 525 Line Progressive Scan Television Systems

ITU-R BT.1362 (02/98), Interfaces for Digital Component Video Signals in 525- and 625-Line Progressive Scan Television Systems

3 Introduction

High-definition television equipment and systems capable of a variety of image formats use the 1.485 Gb/s or 1.485/1.001 Gb/s serial digital interface. This high-definition equipment and these systems will, in many cases, be capable of processing other scanning formats, such as 525-line interlaced/progressive and 625-line interlaced/progressive.

To allow the use of a single digital interface for these formats, in addition to the originally intended 1125-line interlaced/progressive and 750-line progressive scan formats, this standard defines the transport of alternate formats through an SMPTE 292M serial digital interface.

This specification is based on adjusting the number of lines to match those of the source formats while keeping a common clock rate. Each source format is mapped onto the interface format, as specified in clause 5.

4 Source formats

Frame and line structure, parallel and multiplexed word rate, and reference standards for the alternate source formats to be transmitted through a 1.485 Gb/s serial digital interface are shown in the top half of table 1. The meanings of the case and type values in table 1 are described in the next clause. Word count values in the table are for either the Y, C_b/C_r source format or the R, G, B, A source format.

5 Interface format

5.1 Serial data formatting

The serial data format, channel coding, coaxial cable interface, and optical fiber interface shall be as specified in SMPTE 292M.

5.2 Interface format parameters

The frame and line structure, parallel and serial word rate, and case and type of the interface format shall be as shown in the bottom half of table 1 and figure 1. Word count values in the table are for either the Y or C channel of the interface format.

5.3 Case value

The case value of table 1 shall be used to define

the number of lines per frame and whether the available data area is a standard (S) or extended (E) length. The length value defines the horizontal line parameters including total line length, data area length, and H-ANC length. The specification of the available data area is dependent on the interface line number rate and the values are defined in table 1.

5.4 Type value

The type value of table 1 shall be used to define the method of source format data packing onto the interface. Source format data may be either interlaced (I) or progressive (P) and mapped onto the interface as defined later in this standard.

5.5 Interface word rate

The interface parallel word rate shall be exactly 74.25 Mwords/s.

NOTE – The interface parallel word rate is exactly 74.25 Mwords/s even for 525-line 29.97 frame rate source formats.

5.6 Interface frame rate

In the case of 525-line source formats, the frame rate of the interface format shall be 30/1.001 Hz 2:1 interlaced. In the case of 625-line source formats, the frame rate of the interface format shall be 25 Hz 2:1 interlaced.

5.7 Lines per frame

The total lines per frame of the interface format shall be the same as the total lines per frame of the source format.

5.8 Words per line

In the case of 525-line interlaced and progressive source formats, the total words per line of the interface format shall be 4719. In the case of 625-line interlaced source formats, the total words per line of the interface format shall be 4752.

NOTE – These numbers are derived from the following equation:

$$74.25 \text{ Mwords} = 525 \times 4719 \times 30/1.001 = 625 \times 4752 \times 25$$

Table 1 – Parameters of source and interface format

	Source format										
No.	Total lines per frame	Total words per line	Frame rate (Hz)	Fields per frame	Parallel and multiplexed word rate	Signal type	Reference standards				
1	525	858	30/M	2	27 Mb/s	4:2:2i	SMPTE 125M/SMPTE 259M				
2		1144	30/M	2	36 Mb/s	4:2:2i	SMPTE 267M/SMPTE 259M				
3		858	30/M	2	54 Mb/s	4:4:4:4i	SMPTE RP 174/SMPTE 344M				
4		858	60/M	1	27 Mb/s x2	4:2:2p	SMPTE 293M/SMPTE 294M				
5		858	60/M	1	54 Mb/s	4:2:2p	SMPTE 293M/SMPTE 344M				
6		858	60/M	1	36 Mb/s	4:2:0p	SMPTE 293M/SMPTE 294M				
7	625	864	25	2	27 Mb/s	4:2:2i	ITU-R BT.601/ITU-R BT.656				
8		1152	25	2	36 Mb/s	4:2:2i	ITU-R BT.601/ITU-R BT.656				
9		864	25	2	54 Mb/s	4:4:4:4i	ITU-R BT.799/SMPTE 344M				
10		864	50	1	27 Mb/s x2	4:2:2p	ITU-R BT.1358/ITU-R BT.1362				
11		864	50	1	54 Mb/s	4:2:2p	ITU-R BT.1358/SMPTE 344M				
12		864	50	1	36 Mb/s	4:2:0p	ITU-R BT.1358/ITU-R BT.1362				
	Interface format										
No.	Total lines per frame	Total words per line	Frame rate (Hz)	Fields per frame	Parallel and multiplexed word rate	Words per data area	Words per H-ANC	Case	Length	Type	
1	525	4719	30/M	2	74.25 Mb/s	4100	607	A	S	I	
2						4100	607	A	S	I	
						4580	127	B	E	I	
3						4100	607	A	S	I	
4						4100	607	A	S	I	
5						4100	607	A	S	P	
6		4580	127			B	E	I			
7	625	4752	25				4100	640	C	S	I
8						4100	640	C	S	I	
						4612	128	D	E	I	
9						4100	640	C	S	I	
10						4100	640	C	S	I	
11				4100	640	C	S	P			
12		4612	128	D	E	I					
NOTE – M = 1.001, S = standard, E = extended.											