

for Television —

720 × 483 Active Line at 59.94-Hz Progressive Scan Production — Bit-Serial Interfaces



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1 Scope

This standard defines two alternatives for bit-serial interfaces for the 720 × 483 active line at 59.94-Hz progressive scan digital signal for production, defined in ANSI/SMPTE 293M. Interfaces for coaxial cable are defined, each having a high degree of commonality with interfaces operating in accordance with ANSI/SMPTE 259M (BTA Report T-1004 contains additional information regarding the application of these interfaces in practical systems):

- a) Dual-link interface (4:2:2P): Each link operating at 270 Mb/s, in which the active data in the Y' , C'_B , C'_R format (equivalent to 8:4:4) are transparently divided, line sequentially, into two data streams, each equivalent to the 4:2:2 component signal of ANSI/SMPTE 259M.
- b) Single-link interface (4:2:0P): Operating at 360 Mb/s, in which the active data representing the color-difference components in the Y' , C'_B , C'_R format (equivalent to 8:4:4) are field quincunx down-converted by a factor of two, prior to reformatting with the

full luminance data, into a single data stream equivalent to the component signal of ANSI/SMPTE 259M (but at a higher data rate, conceptually 8:4:0).

NOTES

- 1 The data rate of 360 Mb/s is related by a factor of 4/3 to the basic data rate of 270 Mb/s specified for 4:2:2 component signals in ANSI/SMPTE 259M.
- 2 The down-conversion of the color-difference components results in an equivalent spatial sampling grid for each that is similar in the horizontal and vertical dimension.
- 3 The term *line* in this standard refers to the digital line in the 483-line frame raster as described in ANSI/SMPTE 293M.

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 listed below.

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

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

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

SMPTE RP 184-1996, Specification of Jitter in Bit-Serial Digital Systems

IEC 60169-8 (1978-01), Radio Frequency Connectors, Part 8: R. F. Coaxial Connectors with Inner Diameter of Outer Conductor 6.5 mm (0.256 in) with Bayonet Lock — Characteristic Impedance 50 Ohms (Type BNC), and Amendment No. 1 (1996-03) and Amendment No. 2 (1997-11)

3 General

3.1 The specification of a system claiming compliance with this standard shall state which of the systems shown in table 1 is implemented.

3.2 The following are notes referring to the nomenclature used in this standard:

- 483P: The 720 samples $\times$ 483 active lines at 59.94-Hz progressive scan production standard as described in ANSI/SMPTE 293M;
- f_s : Horizontal parallel data sampling rate, 27 MHz;
- Y', C' : Main channel luminance, color-difference data;
- Y'', C'' : Subchannel luminance, color-difference data;
- Link A: 4:2:2P main channel;
- Link B: 4:2:2P subchannel;

- C'_{Bv}, C'_{Rv} : Vertically filtered and quincunx sub-sampled color-difference data.

4 Dual-link interface (4:2:2P)

4.1 The main parameters of the dual-link (4:2:2P, 2×270 Mb/s) interface are shown in table 1.

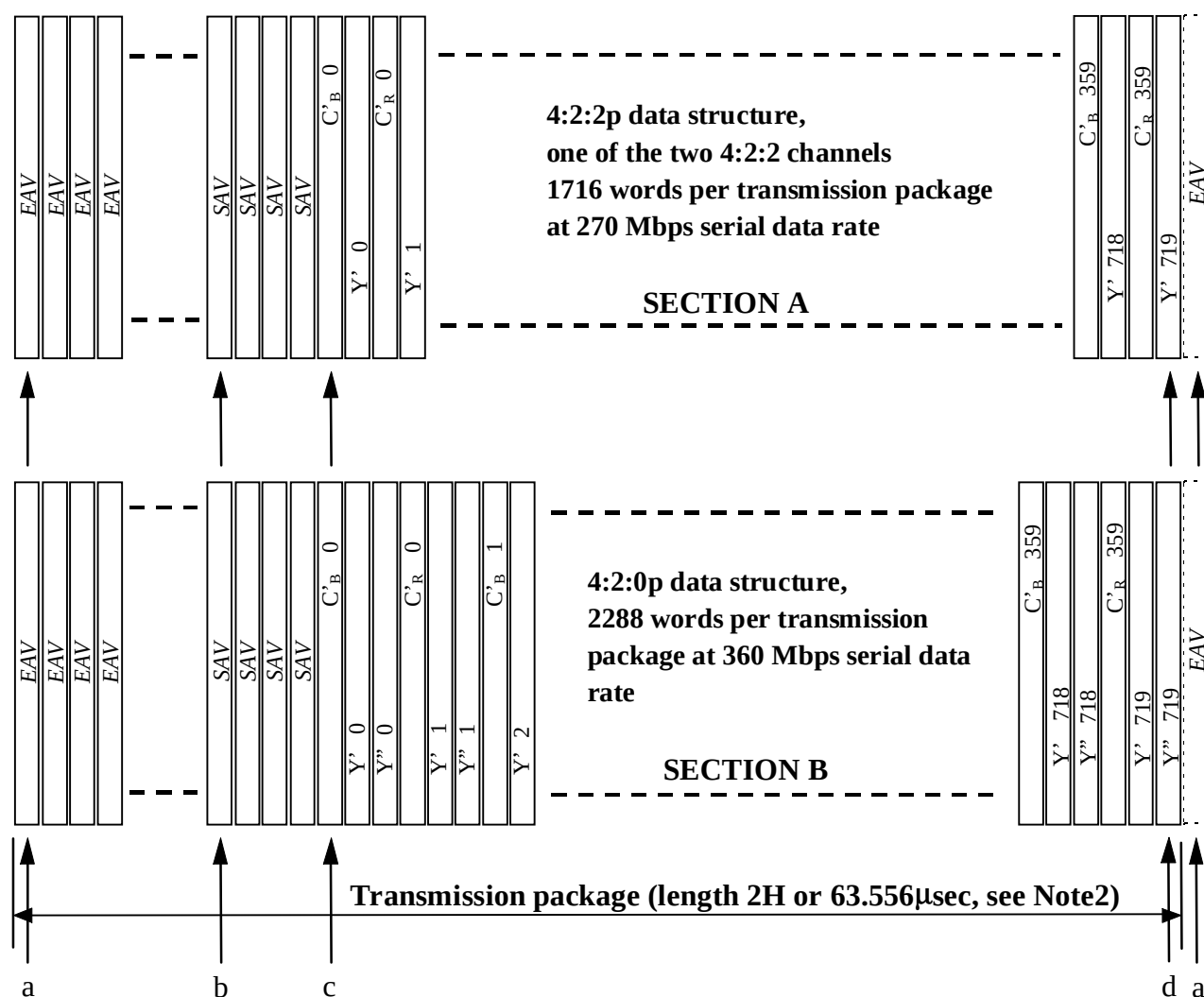
4.2 The processing of the data from the 8:4:4 level of the 720×483 active line at 59.94-Hz progressive scan production (see ANSI/SMPTE 293M) is illustrated in figures 1, 2, and 3. Essentially, the odd lines of one field and the even lines of the next field are selected line by line and formed into the data for one interface link, while the even lines of the field and the odd lines of the next field are selected to form the data for the other interface link. In the output field where the odd-numbered lines of the active input field are interface link A, the F bit of the TRS is set to 0 in both links; where the even-numbered lines of the active input field are in link A, the F bit of the TRS is set to 1.

NOTES

- 1 Buffering having a minimum duration of one horizontal line is required by this process at each interface, making a minimum transmission delay of two horizontal lines.

Table 1 – Parameters of interface data

System (total serial data rate)	4:2:2P (2×270 Mb/s) dual link	4:2:0P (360 Mb/s) single link
Frame rate	60/1.001 Hz	60/1.001 Hz
Word length	10 bits	10 bits
Parallel and multiplexed word rate: channels Y', Y'' and $C'_B/C'_R, C''_B/C''_R$ + SAV, EAV and auxiliary data	2×27 Mwords/s	36 Mword/s
Active lines per frame	483	483
Words per active line (channels Y' and Y'')	720 and 720	720 and 720
Words per active line (channels C'_B and C'_R)	$2 \times (360 \text{ and } 360)$	360 and 360
Words per horizontal blanking area (SAV/EAV and auxiliary data)	2×276 (Total: $2 \times (483 \times 276)$ $= 2 \times 133,308/\text{frame}$)	128 (Total: 483×128 $= 61,824/\text{frame}$)
Words in the active picture area	$2 \times (1440 \times 483) = 2 \times 695,520$	$2160 \times 483 = 1,043,280$
Words in the vertical blanking interval (SAV/EAV and auxiliary data)	$2 \times (1716 \times 42) = 2 \times 72,072$	$2288 \times 42 = 96,096$

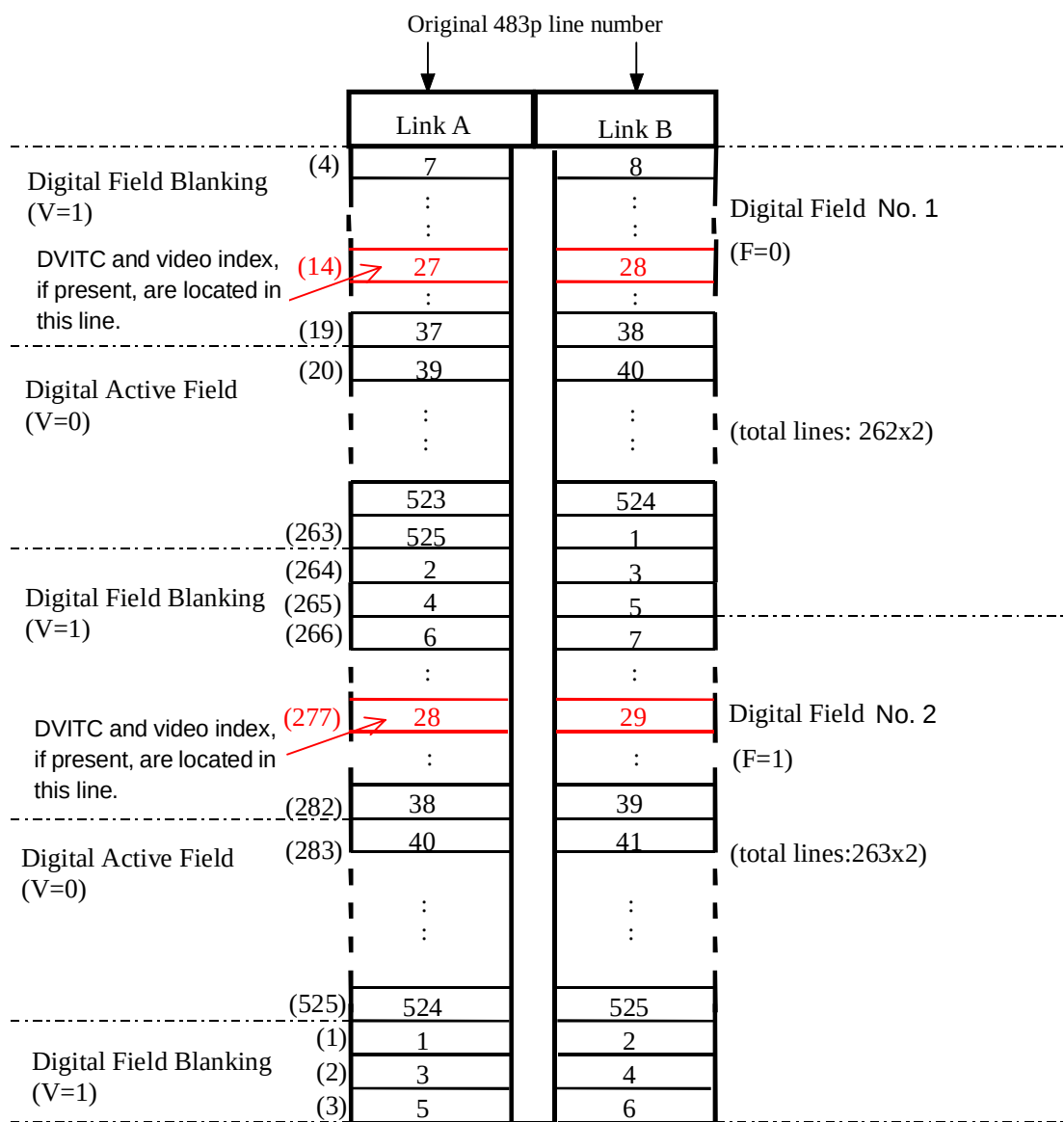


System	Total words per transmission package	Total words of active image data per transmission package	Word number			
			a	b	c	d
			Start of EAV	Start of SAV	Start of active image data	End of active image data
360 Mb/s 4:2:0P	2288	2160	2160	2284	0	2159
270 Mb/s 4:2:2P	1716	1440	1440	1712	0	1439

NOTES

- 1 The time scales for the 4:2:0P and 4:2:2P systems are different.
- 2 H denotes one line period of the original 483P signal as specified by ANSI/SMPTE 293M.
- 3 Color-difference samples are cosited with even-numbered luminance samples and take the half value of the associated luminance sample number.

Figure 1 – Multiplexed horizontal data stream



NOTE – Each link (link A and link B) has a field quincunx line (interlaced) structure to obtain compatibility with a 480-line interlaced system. Therefore, digital fields No. 1 and No. 2 exist in each link.

Figure 2 – Dual-link interfaced (4:2:2P) line numbering and packaging