SMPTE STANDARD

VC-3 Type Data Stream Mapping over SDTI

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Approved
January 15, 2008

Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Administrative Practices.

SMPTE Standard 2019-3 was prepared by Technology Committee N26.

1 Scope

This document specifies the mapping of the VC-3 type compressed picture data stream into the SMPTE 305M SDTI payload area. The VC-3 type compressed picture data stream mapping is defined for source coded progressive 1080P picture rates of 25/P and 30/1.001/P, 720P picture rates of 50/P and 60/1.001/P, and for interlaced 1080I picture rates of 50/I and 60/1.001/I. VC-3 compression rates supported with this mapping are limited to the payload capacity of the 270 Mbps SDTI and are listed inTable 4.

For the transmission of compressed picture data coded at source picture rates of 25/P, 50/P and 50/I, the SDTI operates at a frame rate of 25Hz. For the transmission of compressed picture data coded at source picture rates of 30/1.001/P, 60/1.001/P, and 60/1.001/I, the SDTI operates at a frame rate of 30/1.001 Hz.

2 Conformance Notation

Documents consist of normative text and, optionally, informative text. Normative text is that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except the Introduction, any section explicitly labelled as "Informative" or individual paragraphs that start with "Note:”

Normative references are external documents referenced in normative text that are indispensable to the user. Bibliographic references are references made in informative text or are those otherwise not indispensable to the user. Normative references shall conform to the types and procedures specified in the Engineering Administrative Practices.

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

3 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.

SMPTE 272M-2004, Television — Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space

SMPTE 291M-2006, Television — Ancillary Data Packet and Space Formatting

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

SMPTE 2019-1-2008, VC-3 Picture Compression and Data Stream Format

4 Glossary of Acronyms, Terms and Data Types

The general definition of acronyms, terms and data types used in the SDTI is given in SMPTE 305M. These definitions are not repeated here to avoid any divergence of meaning.

Definitions of terms, abbreviations and symbols relating to VC-3 are given in SMPTE 2019-1.

5 General Specifications (Informative)

This document specifies the mapping of VC-3 type data stream packets over SMPTE 305M (SDTI) at 270 Mbps with 1440 word/line payload. The VC-3 data stream comprises header data, encoded picture data, and EOF end of frame signature.

Since the VC-3 data stream does not include audio data, up to eight channels of 20 or 24-bit AES3 data are optionally mapped into the HANC space of the interface according to SMPTE 272M. Time code and other ancillary data packets conforming to SMPTE 291M may also be mapped into unused HANC and VANC space.

6 Data Mapping in the SDTI Frame

Figure 1 illustrates the location of VC-3 encoded data in the payload region, and the optional eight channels of 24-bit AES3 data mapped into the HANC space. Line numbering is shown for both 525 line and 625 line (in parenthesis) SDTI formats.

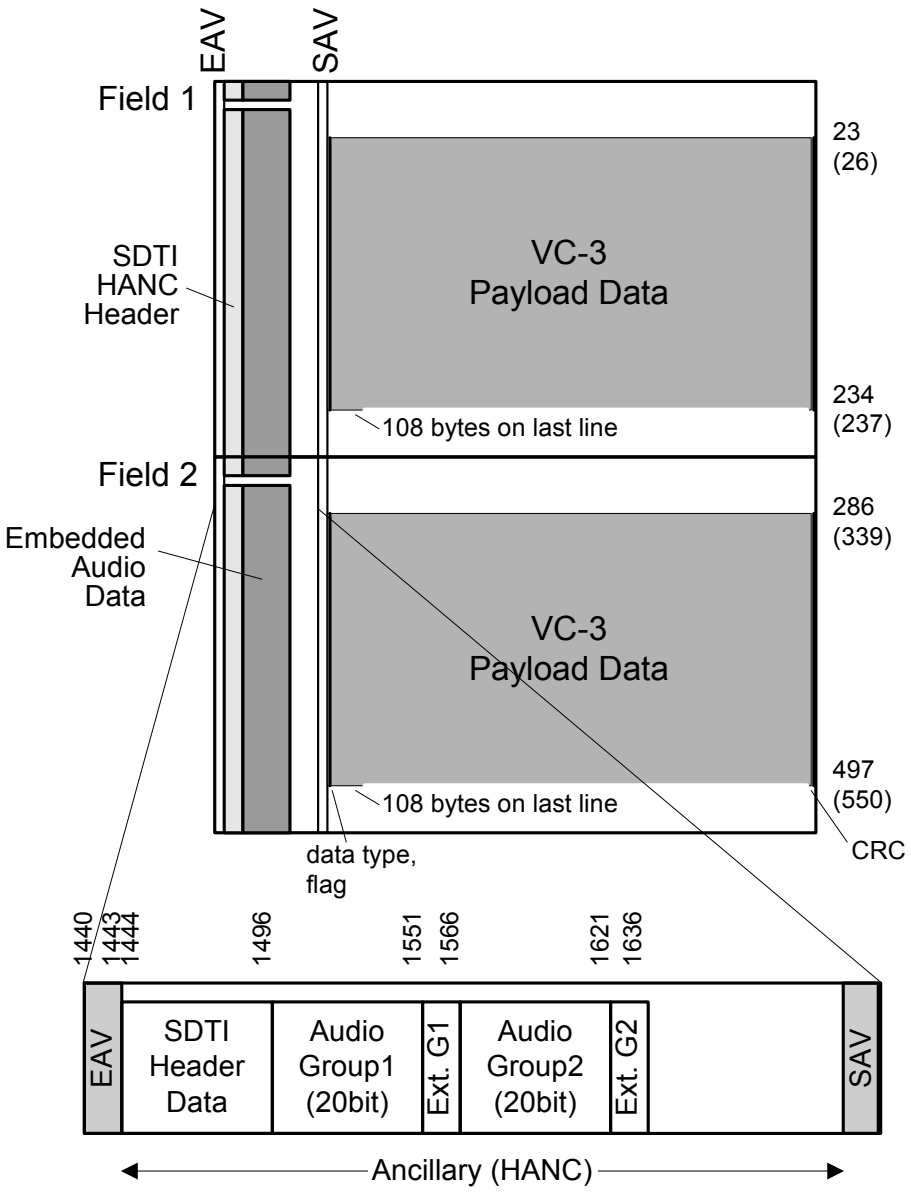

Figure 1 – SDTI Mapping

7 SDTI Header Data

7.1 Location of the SDTI Header Data

SDTI Header data shall be placed in HANC space and immediately following the EAV as specified by SMPTE 305M and as shown in Figure 1. The header shall be present on lines 1–525 except lines 10, 11, 273 and 274 of the 525 line standard, and lines 1-625 except lines 6, 7, 319 and 320 of the 625 line standard.

7.2 Structure of the SDTI Header Data

The structure of the SDTI Header data shall conform to SMPTE 305M. Specific SDTI header data fields required to identify parameters of this SDTI mapping include the code and AAI value, the block type, and the CRC flag. The correct values for these fields are listed in Table 1 below.

Table 1 – Required SDTI Header Data Fields for VC-3 Data Mapping

SDTI Header Data Name	Value	Description
CODE and AAI	101h	Payload:1440 words, AAI: Unspecified
Block Type	101h	Fixed block size of 1438 words without ECC
CRC Flag	101h	Payload CRC shall be inserted

8 Payload Data

The mapping shall use 8-bit data blocks as defined in SMPTE 305M. The payload data, defined by SMPTE 2019-1, VC-3 Picture Compression and Data Stream Format, is carried in the lower 8-bits (B7 through B0) of the 10-bit word. B8 shall be even parity for bits B7 through B0, and B9 shall be the complement of B8.

According to SMPTE 2019-1, the VC-3 data stream comprises header, encoded compressed picture data, and EOF signature as shown in Figure 2.

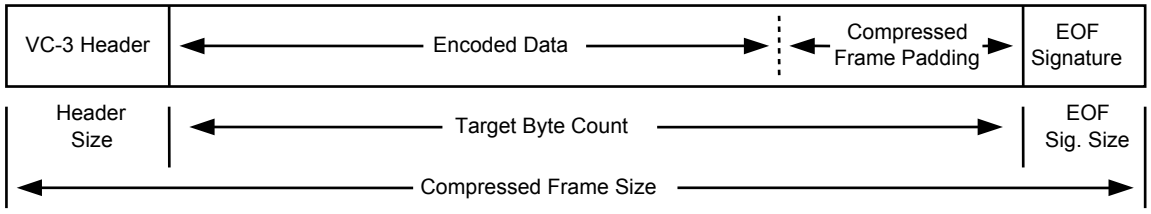

Figure 2 – Compressed Frame Structure

- Compressed Frame Size = VC-3 Header Size + Target Byte Count + EOF Signature Size
- Compressed Frame Size is a multiple of 8KBytes (8192 bytes)
- The Header Size is 640 bytes.
- The EOF Signature Size is 4 bytes

8.1 Location of the VC-3 Type Stream Data

The VC-3 data stream shall be mapped into the payload space of the SDTI located as defined in Table 2 and shown in Figure 1.

Table 2 – Location of Compressed Picture Data

SDTI frame rate	30/1.001Hz	25Hz
Total number of interface lines	525	625
Horizontal mapping location	Samples 0 to 1439	
Vertical mapping location **First field:** **Second field:**	 Lines 23 to 234 Lines 286 to 497	 Lines 26 to 237 Lines 339 to 550

8.2 Structure and Contents of the SDTI Payload Lines

The SDTI payload lines shall use the format defined in Table 3 and illustrated in Figure 3. Word location numbers are given as decimal numbers. Data values are given as hexadecimal numbers.

Table 3 – Contents of Compressed Picture Data

Word No.	Data name	Value	Comment
0	Data type	271h	Data type of VC-3 compressed data
1	User data	200h or 1FEh or 1FDh	Valid data does not exist Valid data start line Valid data line
2 to 1437	User data	data	VC-3 compressed picture data
1438	Payload CRC 0	CRC0	Payload Cyclic Redundancy Code
1439	Payload CRC 1	CRC1	Payload Cyclic Redundancy Code

Within each field containing VC-3 type stream data, the VC-3 type stream data shall start at the first line of the vertical mapping location defined in Table 2. This first payload line shall be identified with the 'valid data start line' user data word. Decoders shall use the 'valid data start line' user data word to detect the start of the VC-3 type stream data.

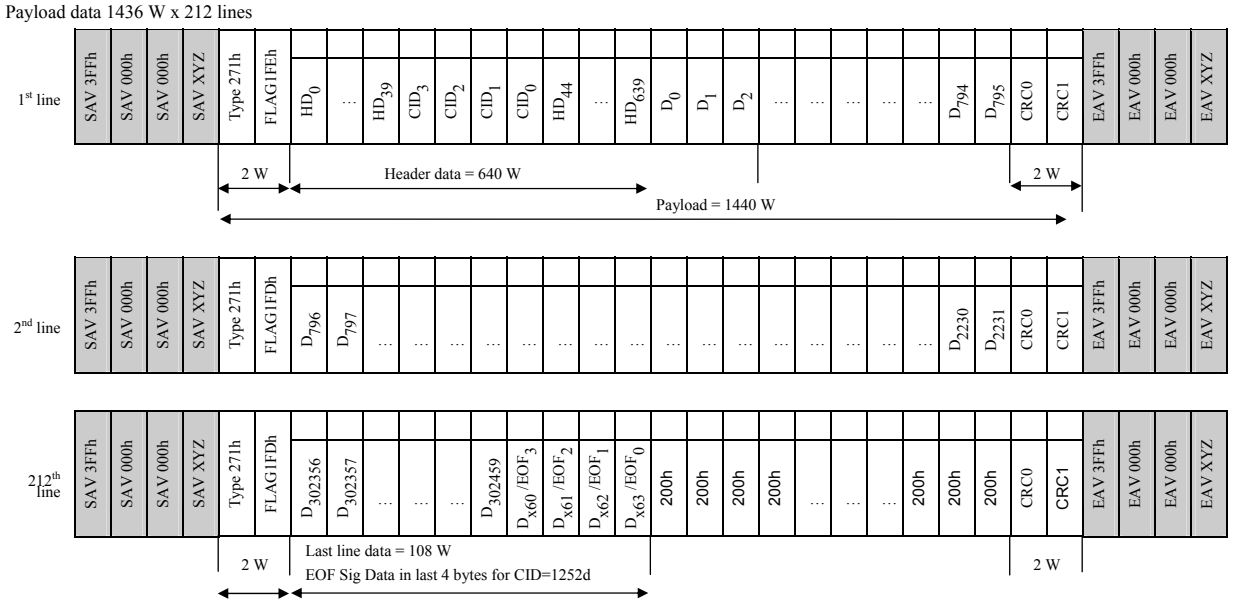

Figure 3 – Payload Data Stream Structure

For each field of the SDTI, VC-3 compressed picture data shall be mapped into the SDTI payload area on contiguous lines. The VC-3 header format is defined in the VC-3 compression standard SMPTE 2019-1. The 32-bit compression identification (CID) field located at bytes 40-43 (28h – 2Bh) of the VC-3 header define the HD format and the size of the compressed data.The VC-3 compressed video formats supported by this SDTI mapping definition are listed with CID values in Table 4.

Table 4 – Header Compression Identification (CID) of HD Format

CID	HD Format	Compressed Frame Size (bytes)	Picture Rates (Hz.)
1237d	1920x1080 Progressive	606,208	25, 30/1.001
1242d	1920x1080 Interlaced	606,208	50, 60/1.001
1252d	1280x720 Progressive	303,104	50, 60/1.001

For 1080P and 1080I HD video formats, with decimal CIDs of 1237 and 1242 respectively, the frame rate shall be identical to the SDTI frame rate. The VC-3 compressed frame totals 606,208 bytes and is divided in two equal lengths. The first half (303,104 bytes) is mapped into the first field of the SDTI payload, and the 2nd half mapped into the second field of the SDTI payload.

For 720P HD formats (CID = 1252) of 50 and 60 Hz. frame rates equal to the SDTI field rate, one entire compressed frame totaling 303,104 bytes shall be carried on each SDTI field.

9 Audio Data

AES3 audio data, if present, shall be mapped according to SMPTE 272M. The location of the audio packets shall immediately follow the SDTI header packet as illustrated in Figure 1.

10 Ancillary Data

Ancillary data packets may be used to map time code and other ancillary data in both HANC and VANC regions. If present, the structure of the ancillary data packets shall conform to SMPTE 291M. HANC data packets shall be located in the available H-ANC space immediately following the last audio data packet.

10.1 Location of Ancillary Data in Vertical Ancillary Region (VANC)

Table 5 – VANC Ancillary Data Lines

Frame rate	29.97Hz	25Hz
Total lines	525	625
VANC lines	Lines 12-22, 275-285	Lines 8-25, 321-338

The ancillary data flag ADF shall immediately follow SAV as specified in SMPTE 291M.

Annex A (Informative)
Bibliography

AES3-2003, Digital Audio Engineering — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data