

Element and Metadata Definitions for the SDTI-CP



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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 ST 331 was prepared by Technology Committee 30MR.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

This standard specifies the formats of the elements and metadata used by the SDTI content package format standard (SDTI-CP).

This standard defines element and metadata formats where they are simply specified or where a publicly available reference is available. It is not intended that this document provide detailed specifications for complex formats which may have broader application.

2 Conformance Notation

Normative text is text 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 labeled as "Informative" or individual paragraphs that start with "Note:"

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.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative References

Note: All references in this document to other SMPTE documents use the current numbering style (e.g. SMPTE ST 12-1:2008) although, during a transitional phase, the document as published (printed or PDF) may bear an older designation (such as SMPTE 12M-2-2008). Documents with the same root number (e.g. 12-1) and publication year (e.g. 2008) are functionally identical.

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 editions of the standards indicated below.

AES3-2009, AES Standard for Digital Audio Engineering — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data

SMPTE ST 12-1:2008, Television — Time and Control Code

SMPTE ST 291:2010, Ancillary Data Packet and Space Formatting

SMPTE ST 309:1999, Television — Transmission of Date and Time-Zone Information in Binary Groups of Time and Control Code

SMPTE ST 312:2001, Television — Splice Points for MPEG-2 Transport Streams

SMPTE ST 326:2000, Television — SDTI Content Package Format (SDTI-CP)

SMPTE ST 328:2000, Television — MPEG-2 Video Elementary Stream Editing Information

SMPTE ST 330:2004, Television — Unique Material Identifier (UMID)

SMPTE ST 336:2007, Data Encoding Protocol Using Key-Length-Value

SMPTE ST 337:2008, Format for Non-PCM Audio and Data in an AES3 Serial Digital Interface

SMPTE RP 186:2008, Video Index Information Coding for 525- and 625-Line Television Systems

ISO/IEC 13818-2:2000, Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Video

4 Type Value of Element and Metadata

Each type of element and metadata listed below includes an element or metadata type value. This type value is not related to the data type values specified in SMPTE ST 305. The SDTI data type defines an item type, whereas this standard specifies element and metadata types.

The ranges of element and metadata type values for each item shall be as follows:

- Picture item: Element type range = 01_h to 0F_h inclusive.
- Audio item: Element type range = 10_h to 1F_h inclusive.
- Auxiliary item: Element type range = 20_h to 77_h inclusive.
- System item: Element type range = 78_h to 7F_h inclusive.
- System item: Metadata type range = 80_h to FF_h inclusive.

A type value of 00_h is not a valid value for either elements or metadata.

Elements types defined for use in the auxiliary item may be used in picture or audio items where so stated.

5 System Elements

5.1 Control Code Element

Type value = 78_h

Reserved but not yet defined.

6 Picture Elements

6.1 MPEG-2 Picture Element

Type value = 01_h

The MPEG-2 picture element shall be defined by the MPEG-2 video elementary stream (V-ES) of any profile or level according to ISO/IEC 13818-2.

The MPEG-2 picture element shall comprise the MPEG V-ES for one video frame together with all the MPEG-2 header information (including extensions) required to support the independent decoding of each picture.

The key start codes for MPEG-2 video elementary streams are:

- Sequence header (S): 00, 00, 01, B3;
- GOP header (G): 00, 00, 01, B8;
- Picture header (P): 00, 00, 01, 00;
- Sequence end code (E): 00, 00, 01, B7.

An example V-ES bitstream is shown in Figure 1. The MPEG-2 V-ES bit stream is simply formatted into a data block as indicated in the figure. No other data is required.

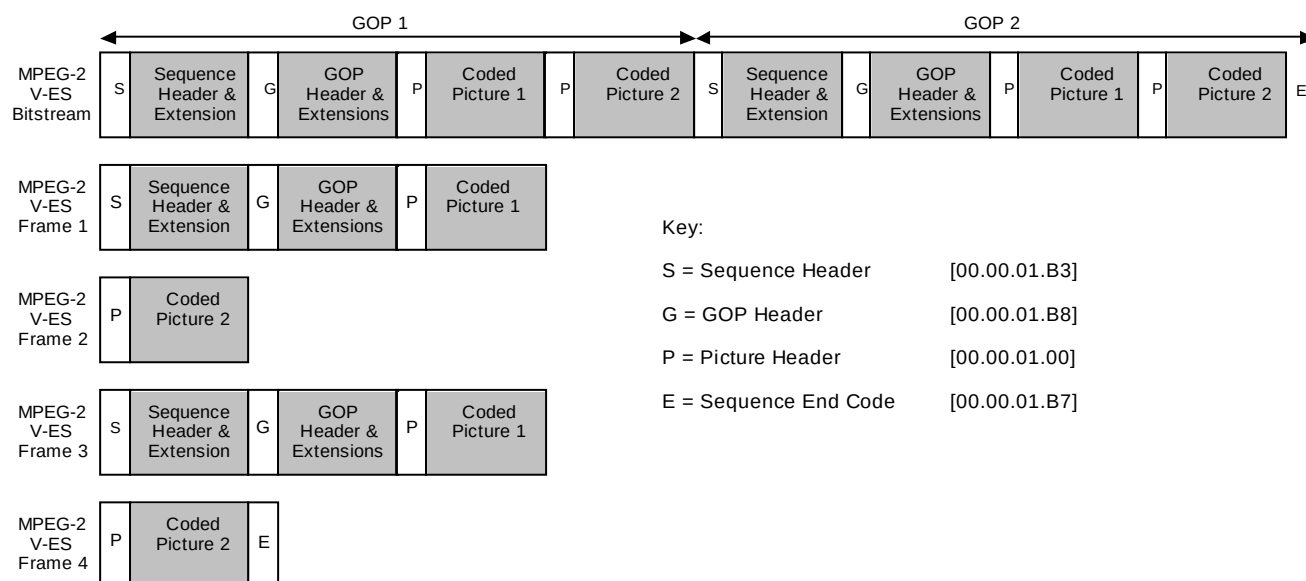


Figure 1 – Example formatting of a V-ES into MPEG-2 element frames

It is recommended that the MPEG-2 picture element complies with SMPTE ST 328 (MPEG-2 elementary stream editing information). The following informative list of points summarizes the provisions of that standard for the repetition of MPEG-2 GOP and sequence header information.

- If the picture to be formatted is not an I-picture, then the data from the picture header code up to, but not including, either the next GOP or picture header is formatted into a block;
- If the picture to be formatted is an I-picture, then the data from the sequence, GOP and picture headers up to, but not including, either the next GOP or picture header is formatted into a block;

- It is recommended that the sequence header information be repeated at each I-picture with the information placed immediately prior to the GOP header information. Thus information about the sequence is readily available following any editing process. If sequence header information were not repeated so frequently, then edit processes may easily remove this information making downstream processing more difficult or even impossible;
- A sequence end code shall be retained with the end of the last picture in the sequence. After editing, a new sequence end code shall be added to the end of a sequence if it does not already exist. The sequence of pictures is per the MPEG-2 picture bit stream including any discontinuity which may result from the use of B-pictures. Any picture stream timing metadata in the system Item shall reflect the decoded picture display sequence and thus the timing may appear discontinuous in the event of B-frames.

The byte alignment of both MPEG-2 and SDTI-CP is identical and this alignment is maintained in this standard. However, it should be noted that the bit stream orders of MPEG-2 and SDI differ in that the MPEG-2 bitstream is MSB first, whereas the SDI bit stream is LSB first.

Note: SMPTE RP 204 provides templates for the use of this element in SMPTE ST 326 together with a definition of a SMPTE label to identify the element complexity for interchange.

7 Audio Elements

7.1 8-Channel AES3 Element

Type value = 10_h

The data format of each channel of the 8-channel AES3 element is defined by the AES3 interface specification. Although the AES3 specification is limited to 2 channels, the 8-channel AES3 element is able to carry up to eight individual channels of AES3 data transparently. The I/O to the element will typically use AES3 twin-channel interfaces. Each AES3 channel may contain either linear PCM audio or data according to the AES3 specification.

The data format for an 8-channel AES3 element is shown in Figure 2. The element data area shall contain AES3 audio or data samples for the period of the picture frame as close as possible.

Up to 8 channels of AES3 data shall be multiplexed on a word-by-word basis; i.e., the first word (W) of each channel (Ch) is multiplexed into the sequence:

W1 Ch1, W1 Ch2, W1 Ch3, W1 Ch4, W1 Ch5, W1 Ch6, W1 Ch7, W1 Ch8

W2 Ch1, W2 Ch2, W2 Ch3, W2 Ch4, W2 Ch5, W2 Ch6, W2 Ch7, W2 Ch8

etc.

The format of the bits in each word is defined in Figure 2.