

SMPTE RECOMMENDED PRACTICE

Conversion from CEA-608 Data to SMPTE-TT



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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 RP 2052-10 was prepared by Technology Committee 23B.

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 recommended practice document defines the preferred method of converting from CEA-608 data streams to SMPTE-TT (as defined in SMPTE ST 2052-1). This document details how such a conversion can be made, and defines some constraints on the translation process so that the resulting SMPTE-TT file is interoperable between SMPTE-TT implementations.

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

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

SMPTE ST 2052-1:2010, Timed Text Format (SMPTE-TT)

CEA-608-E (ANSI) (2008), Line 21 Data Services

4 Definitions and Acronyms

4.1 Definitions

CEA-608: the term is used in this document to refer to the CEA-608 standard or to a data stream complying to that standard, depending on context. CEA 608 closed captions are composed of a byte sequence which is carried embedded in a video signal, and which when played on a suitably equipped video device creates text captions on the display.

Chunk: A segment of a media timeline that forms part of a larger contiguous sequence of timeline segments where each segment has a 1 to 1 mapping with a SMPTE-TT document.

Namespace: mechanism for scoping the definitions of names in an XML document.

Presentation processor: Hardware or software that creates a visible rendition of a document as defined in W3C TTML

SMPTE-TT document: an encoding of some XML content conforming to the SMPTE-TT document type.

4.2 Acronyms

TTML: (W3C) Timed Text Markup Language

CEA: Consumer Electronics Association

SMPTE-TT: SMPTE Profile of W3C Timed Text

TTML: (W3C) Timed Text Markup Language

W3C: World Wide Web Consortium

XML: eXtensible Markup Language

XDS: eXtended Data System

5 CEA-608 Data Mapping to SMPTE-TT

This document defines conversion from CEA-608 data streams to a SMPTE-TT document (or series of document chunks) that will, when presented using a conforming SMPTE-TT Presentation Engine, give a functionally equivalent display. In most cases there will be no single correct translation, but multiple possible interpretations that will generate a similar outcome when rendered. The constraints given in this document are intended to promote consistency amongst implementations of SMPTE-TT processors and to improve interoperability of SMPTE-TT files when displayed on those different implementations.

CEA-608 data can be obtained from various sources, including extraction from the NTSC line 21 waveform, data carried in line 21 of serial digital interface video or other methods such as directly from caption authoring file formats. Many formats may be acceptable so long as they enable the output waveform recreated by a presentation processor from tunneled data to conform to the CEA-608 standard.

The reference model for CEA-608 captioning contains two 32 x 15 character memories, one of which corresponds to the currently displayed captions, and another which is an off-screen composition area. The text which is mapped to SMPTE-TT corresponds to the text placed in the current display memory.

5.1 Conversion Constraints

SMPTE-TT documents converted from CEA-608 data streams shall have the constraints defined in section 5 of this specification. The process of translation from a specific CEA-608 data stream may lead to a number of possible SMPTE-TT documents; no unique conversion is defined by this document.

5.2 SMPTE Namespaces for CEA-608

TTML allows for metadata to be added in private namespaces. SMPTE-TT documents need not use the prefixes below, although such prefixes are used in examples throughout this specification. It is assumed that if a full namespace declaration is not given in an example XML fragment then the definitions in Table 1 – Namespaces are set in an outer context in the surrounding XML.

Table 1 – Namespaces

Name	Prefix	Value
608 metadata	m608:	http://www.smpte-ra.org/schemas/2052-1/2010/smpte-tt#cea608

5.3 Translating Metadata Information

The URI used for the origin attribute shall be: <http://www.smpte-ra.org/schemas/2052-1/2010/smpte-tt#cea608>.

The following metadata attributes may be added to the smpte:information item.

5.3.1 m608:channel

The channel(s) from which the translation was made.

Values: (CC1 | CC2 | CC3 | CC4)+
 Initial: CC1
 Applies to: smpte:information
 Inherited: no
 Percentages: N/A
 Animatable: none

5.3.2 m608:fieldStart

Determines the field association of the bytes in tunneled data (see section 5.10)

Values: 1 | 2
 Initial: 1
 Applies to: smpte:information
 Inherited: no
 Percentages: N/A
 Animatable: none

5.3.3 XDS Data attribute: programName

Values:	<string> none
Initial:	none
Applies to:	smpte:information
Inherited:	no
Percentages:	N/A
Animatable:	none

Note: The values of this attribute are drawn from CEA-608 §9.5.1.3.

Program name may be carried in composite XDS Data, or in its own packet in the CEA-608 data. Either form may be used to set this attribute, however if program name is specified in both forms, then that specified in its own packet shall take precedence for setting this attribute.

5.3.4 XDS Data attribute: programType

Values:	<word>{2,32}* none
Initial:	none
Applies to:	smpte:information
Inherited:	no
Percentages:	N/A
Animatable:	none

Note: The values of this attribute are drawn from CEA-608 §9.5.1.4

5.3.5 XDS Data attribute: contentAdvisory

Values:	<string> none
Initial:	none
Applies to:	smpte:information
Inherited:	no
Percentages:	N/A
Animatable:	none

Note: The values of this attribute are drawn from CEA-608 §9.5.1.5

5.3.6 XDS Data attribute: captionService

Values:	<string>
Initial:	none
Applies to:	smpte:information
Inherited:	no
Percentages:	N/A
Animatable:	none

Note: The values of this attribute are drawn from CEA-608 §9.5.1.7

The original data for this attribute is in binary format, the value of this string is constructed by the concatenation of the short form strings in Table 2 – Field and Channel mapping separated by whitespace:

Table 2 – Field and Channel mapping

Binary value	Value string	Short form
0 0 0	field one, channel C1, captioning	F1C1CC
0 0 1	field one, channel C1, Text	F1C1TX
0 1 0	field one, channel C2, captioning	F1C2CC
0 1 1	field one, channel C2, Text	F1C2TX
1 0 0	field two, channel C1, captioning	F2C1CC
1 0 1	field two, channel C1, Text	F2C1TX
1 1 0	field two, channel C2, captioning	F2C2CC
1 1 1	field two, channel C2, Text	F2C2TX

5.3.7 XDS Data attribute: copyAndRedistributionControl

Values:	<string>
Initial:	none
Applies to:	smpte:information
Inherited:	no
Percentages:	N/A
Animatable:	none

Note: The values of this attribute are drawn from CEA-608 §9.5.1.8

5.3.8 XDS Data attribute: captionLanguage

If the SMPTE-TT is encoding the Primary Synchronous Caption Service (CC1) then the content is primary language captioning data in the same language; thus the language code used on the root xml:lang attribute shall be the ISO language code defined by the audio language bits (see CEA-608 §9.5.1.6) from Table 3 – Language codes:

Table 3 – Language codes

L2	L1	L0	Language	xml:lang code
0	0	0	Unknown	⁶¹⁷⁷
0	0	1	English	"en"
0	1	0	Spanish	"es"
0	1	1	French	"fr"
1	0	0	German	"de"
1	0	1	Italian	"it"
1	1	0	Other	⁶¹⁷⁷
1	1	1	None	⁶¹⁷⁷

If the SMPTE-TT is encoding the Secondary Synchronous Caption Service (CC3), or one of the Special Non-synchronous channels (CC2, CC4), then the ISO language code for the language shall be used for the xml:lang attribute when the language is known, otherwise the empty string value shall be used for Unknown, Other, or None.