

DTV Closed-Caption Server
to Encoder Interface



Table of Contents	Page
Foreword	2
1 Scope	3
2 Conformance Notation	3
3 Normative References	3
4 Definitions	4
4.1 Acronyms and Abbreviations	4
4.2 Definition of Terms	4
4.3 Section and Data Structure Syntax Notation	4
5 Physical Interface	4
5.1 9-Pin Connector	4
5.2 Interface Parameters	5
6 Communications Protocol	5
6.1 Closed-Caption Packet	5
6.2 Encoder Requests and Responses	7
6.3 Determination of the Value 'x' for SYNx (Informative)	8
6.4 Bite Rate Jitter to Reach Average Bit Rate (Normative)	9
6.5 Startup Case	9
6.6 Normal Case	9
6.7 Server Response (Informative)	10
6.8 Timeout	10
6.9 Caption Services	10
6.10 Protocol State Tables	11
Annex A Bibliography (Informative)	13
Annex B Related Standards (Informative)	14

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.

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SMPTE Standard 333 was prepared by Technology Committee D27.

1 Scope

This standard defines a serial interface for transmission of CEA-708 digital television closed caption data from a caption server to video encoder to be used for populating the closed-caption structure in the compressed video stream.

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 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 334-2-2007, Caption Distribution Packet (CDP) Definition

CEA-708-C (2007), Digital Television (DTV) Closed Captioning

TIA 574 (2003), 9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange¹

¹ TIA 574 is an extension of TIA-232 (2002) that specifies a 9-pin connector and speeds faster than 20 kb/s; i.e., an RS-232 port on a personal computer (TIA-232 specifies neither a 9-pin connector nor speeds faster than 20 kb/s).

4 Definitions

4.1 Acronyms and Abbreviations

The following acronyms and abbreviations are used within this specification:

ATSC: Advanced Television Systems Committee.

DTVCC: Digital Television Closed Captioning.

4.2 Definition of Terms

The following terms are used throughout this standard:

caption server: A device that delivers DTVCC formatted data for insertion in picture level user-data within an MPEG video elementary stream.

cc_data triplet: A sequence of three 8-bit bytes which consists of an identifier/flag byte plus two data bytes. Normally just referred to as a “triplet” in this standard.

video encoder: A device that encodes video into a compressed format.

4.3 Section and Data Structure Syntax Notation

This standard contains symbolic references to syntactic elements. These references are typographically distinguished by the use of a different font (e.g., **restricted**), may contain the underscore character (e.g., **sequence_end_code**), and may consist of character strings that are not English words (e.g., **dynrng**).

4.3.1 Syntactic Notation

The formats of sections and data structures in this standard are described using a C-like notational method employed in ISO/IEC 13818-1.

4.3.2 Numeric Notation

Within this standard, conventional numbers denote decimal values, numbers preceded by 0x are to be interpreted as hexadecimal values and numbers within single quotes (e.g., ‘10010100’) are to be interpreted as a string of binary digits.

5 Physical Interface

The physical interface between the caption server and the video encoder shall be an TIA 574 interface, with restrictions as specified in § 5.2.

5.1 9-Pin Connector

The encoder shall be DCE and provide a female 9-pin connector as described in TIA 574 with the pin-out described in Table 1.

Table 1 – 9-pin connector pin-out

Pin	Signal	Signal source	Description
1	NC	N/A	Not connected
2	TXD	Video encoder	Serial data transmit
3	RXD	Caption server	Serial data receive
4	NC	N/A	Not connected
5	GND	N/A	Signal ground
6	NC	N/A	Not connected
7	RTS	Caption server	Request to send. The video encoder shall ignore the state of this pin.
8	CTS	Video encoder	Clear to send. When asserted, the caption server may transmit data to the video encoder.
9	NC	N/A	Not connected

5.2 Interface Parameters

The video encoder and caption server shall each provide an TIA-574 interface with the parameter settings from Table 2.

Table 2 – TIA 574 interface parameters

Parameter	Setting
Baud rate	38,400 b/s
Data bits	8
Parity	None
Stop bits	1
Start bits	1

6 Communications Protocol

The caption server shall provide data to the video encoder as the video encoder requests it. The communications protocol is described below.

6.1 Closed-Caption Packet

The caption server shall provide captioning data to the video encoder using the syntax described in Table 3. This data shall consist of one or more fields-worth of data. The data may arrive in any field order per CEA-708-C § 4.4.2.