

CEA Standard

Digital Television (DTV) Closed
Captioning

CEA-708-D

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(Formulated under the cognizance of the CEA's **R4.3 TV Data Systems Subcommittee.**)

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CONTENTS

1 Scope	1
1.1 Overview	1
1.2 Notation	1
1.2.1 Binary Notation	2
1.2.2 Hex Notation	2
1.2.3 Equals and Assignment	2
1.2.4 Bitstream Syntax Notation	2
1.2.5 Acronyms & Mnemonics	2
2 Normative References	3
2.1 Normative Reference List	3
2.1.1 Normative Reference Acquisition	4
2.2 Informative References	4
2.2.1 Informative Reference List	4
2.2.2 Informative Reference Acquisition	5
3 Caption Channel Layered Protocol	6
4 DTVCC Transport Layer	9
4.1 9,600 Bits per Second DTVCC Transport Channel	9
4.2 Pre-Allocated Bandwidth	9
4.3 CEA-608 Datastream	9
4.3.1 Transport	10
4.3.2 Generating a CEA-608 datastream	10
4.4 DTV cc_data() structure	12
4.4.1 Captioning Data Semantics	12
4.4.2 Frame Rates	14
4.4.3 Typical Video Signals	16
4.4.4 Latency	17
4.5 Caption Service Metadata	18
4.5.1 Decoder Processing of Metadata	19
4.6 Shortened Caption Channel Packets	19
4.7 Independent Control of Audio and Caption Services	19
5 DTVCC Packet Layer	19
6 DTVCC Service Layer	21
6.1 Services	21
6.2 Service Blocks	21
6.2.1 Standard Service Block Header	22
6.2.2 Extended Service Block Header	22
6.2.3 Null Service Block Header	22
6.2.4 Service Block Data	23
6.2.5 Service Blocks within Caption Channel Packets	23
6.3 Transport Constraints on Encapsulating Caption Data	24
7 DTVCC Coding Layer - Caption Data Services (Services 1 - 63)	26
7.1 Code Space Organization	27
7.1.1 Extending the Code Space	28
7.1.2 Unused Codes	29

7.1.3 Numerical Organization of Codes	29
7.1.4 Code Set C0 - Miscellaneous Control Codes	29
7.1.5 C1 Code Set - Captioning Command Control Codes	31
7.1.6 G0 Code Set - ASCII Printable Characters	32
7.1.7 G1 Code Set - ISO 8859-1 LATIN-1 Character Set	33
7.1.8 G2 Code Set - Extended Miscellaneous Characters	34
7.1.9 G3 Code Set - Future Expansion.....	35
7.1.10 C2 Code Set - Extended Control Code Set 1.....	36
7.1.11 C3 Code Set - Extended Control Code Set 2.....	37
8 DTVCC Interpretation Layer	40
8.1 DTVCC Caption Components.....	40
8.2 Screen Coordinates.....	40
8.3 User Options	42
8.4 Caption Windows.....	42
8.4.1 Window Identifier.....	43
8.4.2 Window Priority.....	43
8.4.3 Anchor Points	43
8.4.4 Anchor ID.....	43
8.4.5 Anchor Location	44
8.4.6 Window Size	44
8.4.7 Window Row and Column Locking.....	45
8.4.8 Word Wrapping	46
8.4.9 Window Text Painting	47
8.4.10 Window Display	49
8.4.11 Window Colors and Borders	49
8.4.12 Predefined Window and Pen Styles.....	50
8.5 Caption Pen.....	50
8.5.1 Pen Size	50
8.5.2 Pen Spacing	51
8.5.3 Font Styles.....	51
8.5.4 Character Offsetting	52
8.5.5 Pen Styles.....	52
8.5.6 Foreground Color and Opacity.....	52
8.5.7 Background Color and Opacity.....	52
8.5.8 Character Edges	53
8.5.9 Caption Text Function Tags	54
8.5.10 Pen Attributes	55
8.6 Caption Text.....	55
8.7 Caption Positioning.....	56
8.7.1 Location within Internal Buffer.....	56
8.7.2 Location (0,0).....	56
8.7.3 Caption Row Lengths	56
8.8 Color Representation	56
8.9 Service Synchronization	56
8.9.1 Delay Command.....	56
8.9.2 DelayCancel Command.....	57
8.9.3 Reset Command.....	57
8.9.4 Reset and DelayCancel Command Recognition.....	58
8.9.5 Service Reset Conditions	59
8.10 DTVCC Command Set	59
8.10.1 Window Commands	60
8.10.2 Pen Commands.....	61
8.10.3 Synchronization Commands	61
8.10.4 Caption Text	61
8.10.5 Command Descriptions	61

CEA-708-D

8.11 Proper Order of Data	83
9 DTVCC Decoder Manufacturer Requirements and Recommendations	84
9.1 DTVCC Section 4.2 - Pre-Allocated Bandwidth	84
9.1.1 Integer Rate to NTSC Rate Caption Conversion.....	85
9.2 DTVCC Section 6.1 - Services	85
9.3 DTVCC Section 6.2 - Service Blocks	85
9.3.1 Caption Service Directory and DTVCC Services	85
9.3.2 Decoding 16 Services.....	85
9.3.3 Selecting CEA-608-E Services Regardless of Presence of Caption Service Directory.....	85
9.3.4 Ignoring Reserved Field in caption_service_descriptor()	85
9.4 DTVCC Section 7.1 - Code Space Organization	85
9.5 DTVCC Section 8.2 - Screen Coordinates	86
9.6 DTVCC Section 8.4 - Caption Windows.....	88
9.7 DTVCC Section 8.4.2 - Window Priority.....	88
9.8 DTVCC Section 8.4.6 - Window Size	88
9.9 DTVCC Section 8.4.8 - Word Wrapping	88
9.10 DTVCC Section 8.4.9 - Window Text Painting	88
9.10.1 Justification.....	88
9.10.2 Print Direction	89
9.10.3 Scroll Direction	89
9.10.4 Scroll Rate	89
9.10.5 Smooth Scrolling	90
9.10.6 Display Effects	90
9.11 DTVCC Section 8.4.11 - Window Colors and Borders	90
9.12 DTVCC Section 8.4.12 - Predefined Window and Pen Styles.....	90
9.13 DTVCC Section 8.5.1 - Pen Size	90
9.14 DTVCC Section 8.5.3 - Font Styles.....	90
9.15 DTVCC Section 8.5.4 - Character Offsetting.....	90
9.16 DTVCC Section 8.5.5 - Pen Styles.....	90
9.17 DTVCC Section 8.5.6 - Foreground Color and Opacity.....	90
9.18 DTVCC Section 8.5.7 - Background Color and Opacity.....	90
9.19 DTVCC Section 8.5.8 - Character Edges	91
9.20 DTVCC Section 8.8 - Color Representation	91
9.21 Character Rendition Considerations	92
9.22 DTVCC Section 8.9 - Service Synchronization	93
9.23 DTV to NTSC (CEA-608-E) Transcoders.....	93
9.24 Receivers Without Displays and Set-top Box (STB) Options	93
9.25 Use of CEA-608 datastream by DTV Receivers	94
10 DTVCC Authoring and Encoding for Transmission (Informative)	94
10.1 Caption Authoring and Encoding	94
10.2 Monitoring Captions.....	96
Annex A Possible Decoder Implementations (Informative).....	97
Annex B Transmission	98
B.1 Interpretation of Transmission Syntax	98
Representation of CEA-608-E Caption Signals.....	98
Annex C DTVCC Channel Packet Transmission Examples in MPEG-2 Video (Informative).....	99
C.1 PICTURE 1: picture_structure = 11, top_field_first = 1, repeat_first_field = 1	99
C.2 PICTURE 2: picture_structure = 11, top_field_first = 0, repeat_first_field = 0	99
C.3 PICTURE 3: picture_structure = 11, top_field_first = 0, repeat_first_field = 1	100

Annex D Transmission Order and Display Process Examples in MPEG-2 Video (Informative)	101
Annex E DTVCC in the ATSC Transport with MPEG-2 Video (Informative)	102
E.1 General	102
E.2 MPEG-2 Picture User Data	103
E.2.1 Latency	103
E.3 Caption Service Metadata and PSIP	103
E.4 Caption Service Encoding.....	103
Annex F Frame Rates with MPEG-2 Video (Informative)	105
F.1 Frame Rates	105

Figures

Figure 1 DTV Closed-Captioning Protocol Model.....	8
Figure 2 Example of CEA-608-E Captioning Field Buffers	10
Figure 3 Caption Channel Packet.....	20
Figure 4 Service Block.....	21
Figure 5 Service Block Header	22
Figure 6 Extended Service Block Header	22
Figure 7 Null Service Block Header	23
Figure 8 Service Blocks in a Caption Channel Packets (Example)	24
Figure 9 Example of Window and Grid Location	41
Figure 10 DTV 16:9 Screen and DTVCC Window Positioning Grid.....	42
Figure 11 Anchor ID Location	43
Figure 12 Implied Caption Text Expansion Based on Anchor Points	44
Figure 13 Examples of Caption Window Shrinking when User Selects Small Character Size	45
Figure 14 Examples of Caption Window Growing when Going to Larger Font.....	46
Figure 15 Examples of Various Justifications, Print Directions and Scroll Directions	48
Figure 16 Character Background Color Examples	52
Figure 17 Edge Type Examples	54
Figure 18 Reset & DelayCancel Command Detector(s) and Service Input Buffers.....	58
Figure 19 Reset & DelayCancel Command Detector(s) Detail.....	59
Figure 20 Minimum Grid Location Super Cell Example	87
Figure 21 Caption Authoring and Encoding into Caption Channel Packets	94
Figure 22 Relationship Between Caption Data and Frames	95
Figure 23 DTVCC Transport Stream Decoder for an MPEG-2 Transport	97
Figure 24 DTVCC Caption Data in the DTV Bitstream.....	102

Tables

Table 1 DTVCC Protocol Stack.....	6
Table 2 Captioning Data Structure Syntax	12
Table 3 Closed-Caption Type (cc_type) Coding	13
Table 4 DTVCC Transport Channel Transmit Rate Parameters	15
Table 5 Aligned cc_data() structure and DTVCC Channel Packet Example	16
Table 6 Unaligned Caption Channel Packet Example	16
Table 7 cc_data() structure Example	17
Table 8 DTVCC Caption Channel Packet Syntax	20
Table 9 Service Block Syntax	22
Table 10 DTVCC Code Space Organization.....	27
Table 11 DTVCC Code Set Mapping.....	28
Table 12 C0 Code Set.....	29
Table 13 C1 Code Set.....	31
Table 14 G0 Code Set	32
Table 15 G1 Code Set	33
Table 16 G2 Code Set	34
Table 17 G3 Code Set	35
Table 18 C2 Code Set.....	36
Table 19 Extended Codes and Bytes to Skip—C2 Code Set	37
Table 20 Extended Codes & Bytes to Skip—C3 Code Set	37
Table 21 C3 Code Set.....	38
Table 22 Extended Codes and Bytes to Skip 0x90-0x9F.....	39
Table 23 Cursor Movement After Drawing Characters	48
Table 24 Safe Title Area and Recommended Character Dimensions	51
Table 25 Predefined Window Style IDs	66
Table 26 Predefined Pen Style IDs	67

Table 27 G2 Character Substitution Table.....	86
Table 28 Screen Coordinate Resolutions & Limits.....	86
Table 29 Minimum Color List Table.....	91
Table 30 Alternative Minimum Color List Table.....	92
Table 31 DTVCC Channel Packet Transmission Example A	99
Table 32 DTVCC Channel Packet Transmission Example B	99
Table 33 DTVCC Caption Channel Transmission Example C.....	100
Table 34 DTVCC Transport Channel Transmit Rate Parameters	106

CEA-708-D

FOREWORD

CEA-708-D defines a method for coding text with associated parameters to control its display. CEA-708-D is the standard for Closed Captioning in Digital Television (DTV) technology. Predecessors of CEA-708-D were developed under the auspices of the Consumer Electronics Association (CEA) Technology & Standards R4.3 Television Data Systems Subcommittee in parallel with the U.S. Advanced Television Systems Committee's (ATSC) and the Advanced Television Grand Alliance's definition, design, and development of the audio, video and ancillary data processing standard for Advanced Television. The DTV standard developed by the Grand Alliance and other industry members for caption carriage is documented in ATSC A/53:2007 Part 4. The DTV standard developed by the cable industry in SCTE for caption carriage is documented in SCTE 21.

CEA-708-D supersedes CEA-708-C.

DIGITAL TELEVISION (DTV) CLOSED CAPTIONING

1 Scope

CEA-708-D defines DTV Closed Captioning (DTVCC) and provides specifications and guidelines for caption service providers, distributors of television signals, decoder and encoder manufacturers, DTV receiver manufacturers, and DTV signal processing equipment manufacturers. CEA-708-D may also be useful in other systems. CEA-708-D includes the following:

- a) a description of the transport method of DTVCC data in the DTV signal
- b) a specification for processing DTVCC information
- c) a list of minimum implementation recommendations for DTVCC receiver manufacturers
- d) a set of recommended practices for DTV encoder and decoder manufacturers

The use of the term DTV throughout is intended to include, and apply to, High Definition Television (HDTV) and Standard Definition Television (SDTV).

1.1 Overview

DTVCC is a migration of the closed-captioning concepts and capabilities developed in the 1970's for National Television Systems Committee II (NTSC) television video signals to the digital television environment defined by the ATV (Advanced Television) Grand Alliance and standardized by ATSC. This new television environment provides for larger screens and higher screen resolutions, as well as higher data rates for transmission of closed-captioning data.

NTSC Closed Captioning (CC) consists of an analog waveform inserted on line 21, field 1 and possibly field 2, of the NTSC Vertical Blanking Interval (VBI). That waveform provides a transport channel which can deliver 2 bytes of data on every field of video. This translates to a nominal 60 or 120 bytes per second (Bps), or a nominal 480 or 960 bits per second (bps).

In contrast, DTV Closed Captioning is transported as a logical data channel in the DTV digital bitstream. DTV-specific closed captioning is allocated 9600 bps for each program. This increased capacity opens the possibility for simultaneous transmission of captions in multiple languages and with multiple reading levels, as well as the transport of an entire CEA-608 datastream¹.

The DTV standard also accommodates a variety of increased horizontal and vertical resolutions (e.g., 704x480, 1280x720 and 1920x1080), versus the single 525 vertical scan line format for NTSC. These added resolutions provide for more defined representations of character fonts and other on-screen objects.

The heart of any DTVCC caption display is the caption "window," which is similar to the *window* concept found in many computer Graphical User Interfaces (GUIs). Windows are placed within the DTV screen, and caption text is placed within windows. Windows and text have a variety of color, size and other attributes.

CEA-708-D describes the above issues in a reverse-hierarchical (i.e., low-to-high level) fashion. It follows an "Open Systems Interconnect (OSI) Reference Model"-type protocol stack for layered protocols. DTVCC consists of 5 protocol layers: the Transport Layer, the Packet Layer, the Service Layer, the Coding Layer, and the Interpretation Layer. The discussion of the first 2 layers is a detailed presentation of data organization issues. The discussion of the last 2 layers provides a more informative presentation of the unique aspects of closed captioning. Some readers may wish to start with these last 2 layers first, beginning in Section 7.

1.2 Notation

Designers should interpret CEA-708-D syntax and values based on notational conventions taken from the referenced Motion Picture Experts Group (MPEG), ATSC and CEA standards. Numbering and counting

¹ CEA-608 datastream is a generic term used to mean all valid datastreams from before the original EIA-608 of 1993 on through the current CEA-608-E.