

CEA Standard

Digital Television (DTV) Closed Captioning

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FOREWORD

This standard defines a method for coding text with associated parameters to control its display. This document specifies the standard for Closed Captioning in Digital Television (DTV) technology. Predecessors of this document 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) definition, design, and development of the audio, video and ancillary data processing standard for Advanced Television. The DTV standard developed by the cable industry in SCTE for caption carriage is documented in SCTE 21 [6].

CEA-708-E supersedes CEA-708-D.

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Digital Television (DTV) Closed Captioning

1 Scope

This standard 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-E may also be useful in other systems. This standard 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 in some applications. 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 [1] 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.

This standard 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 this standard's syntax and values based on notational conventions taken from the referenced Motion Picture Experts Group (MPEG), ATSC and CEA standards. Numbering and

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 [1].