National Association of Broadcasters

ENGINEERING HANDBOOK

10th Edition

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CHAPTER

5.24

Closed Captioning Systems

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INTRODUCTION

Captioning, according to the Accessible Media Industry Coalition, is "the process of converting the audio content of a television broadcast, webcast, film, video, CD-ROM, DVD, live event, or other productions into text, which is displayed on a screen or monitor." Captions not only display words as the text equivalent of spoken dialogue or narration, but also include speaker identification and sound effects. It is important that the captions be

- Synchronized and appear at approximately the same time as the audio is available;
- Equivalent and equal in content to that of the audio, including speaker identification and sound effects;
- Accessible and readily available to those who need them.

Captions may be displayed on or adjacent to the video image. *Open captions* are a permanent part of the image and cannot be turned off. *Closed captions* are transmitted with the audio and video, but require a decoder to detect, decipher, and display the captions so that only viewers who wish to see the captions will do so. The data for closed captions is transmitted with the television program, either on line 21 in the vertical blanking interval (VBI) of an analog program, or in a separate data packet accompanying the audio and video of a digital program.

Captioning is distinct from *subtitling* in that captioning includes aural information other than just dialogue, such as sound effects, music effects, and indications of who is speaking, all intended to aid the viewer who is unable to hear the soundtrack. The original target audience for captioning was primarily people who are deaf or hearing impaired (about 20 million in 1980). The market has since expanded to include people learning English as a second language; those learning to read, especially students with reading disabilities; people in noisy places (like bars and airports) or quiet places (like hospitals and spas). Captions generally appear in the lower portion of the television screen and vary in size in proportion to the size of the television screen. The caption characters are sized to be easily visible, typically white letters against a black background (for analog television), and usually do not obstruct essential parts of the picture. Captions for digital television (DTV) can have a wider range of font styles, sizes, and colors than those for NTSC transmissions (see Figure 5.24-1).

Closed captioning may be added in real time to a live program or may be added before transmission as part of postproduction for a prerecorded program.

*Jeff Hutchins updated the analog captioning portion of this chapter drawing on material first published in the 9th edition of the *NAB Engineering Handbook*, Chapter 5.13, "Closed Captioning and Extended Services," by Amnon Salomon and Gerald Freda.
**Alan Lambshead adapted the DTV captioning portion of this chapter from material first published in the *NAB Broadcast Engineering Conference Proceedings 2004*, "Implementing Closed Captioning for DTV," by Graham Jones.

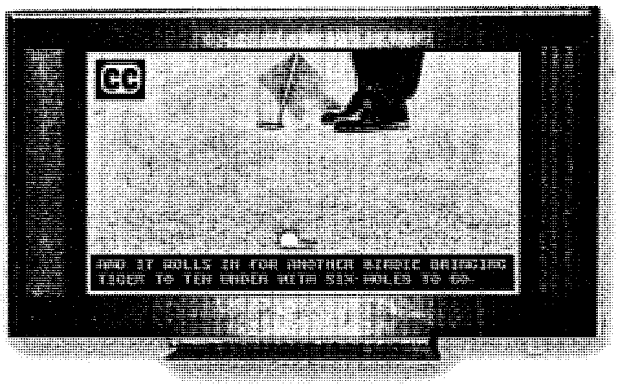

FIGURE 5.24-1 DTV caption data processed by a decoder and displayed as text across the lower portion of the picture.

A BRIEF HISTORY OF CLOSED CAPTIONING

The Public Broadcasting Service (PBS) developed closed captioned technology for NTSC analog television during the period 1973–1979 with funding support from the federal government (Department of Health, Education, and Welfare). Field test transmissions were conducted on all aspects of caption generation, encoding, decoding, and display features of the service.

During those years, a small number of programs were open-captioned by The Caption Center at PBS station WGBH and carried on PBS. The newly created National Captioning Institute (NCI), in cooperation with the ABC, CBS, NBC, and PBS networks, launched the closed captioning service in March 1980 with approximately 16 hours per week of captioned programming. The first consumer product containing the decoding feature, called *TeleCaption*®, was sold by Sears, Roebuck and Co. and was a separate box that worked with a standard television.

FCC Rules and CEA Standards

The line 21 captioning data signal of NTSC analog television signals is protected from interference from any other VBI service, test signal, or spillover from active video under FCC Rules and Regulations, Section 73.682(a)(22), adopted in 1976. These rules also established the transmission standards for captioning and list the uses of the data channel.

Following are highlights from rules associated with the Television Decoder Circuitry Act of 1990 that amended Part 15 of the FCC rules (Radio Frequency Devices, which relate to television receivers).

Television Decoder Circuitry Act of 1990

The U.S. Congress passed the *Television Decoder Circuitry Act of 1990* (Pub. L. 101-431, 104 Stat. 960 (1990)). This act required that, effective July 1, 1993, all television receivers with picture screens 13 inches or greater must be equipped to display closed captioned television transmission, and it required the FCC to enact rules to implement this requirement.

FCC Report and Order 6 of General Docket 91-1 was adopted April 12, 1991, and released to the public on April 15, 1991. The Order became effective July 1, 1993. The Order amends Part 15 of the FCC's rules by adding a new Section 15.119 to set out the FCC Rules for captions and caption decoders. The highlights of this section as it relates to NTSC analog television captioning are as follows:

- Effective July 1, 1993, TV receivers 13 inches or larger must have caption decoders;
- Closed caption information to be carried in line 21 of field 1;
- Decoders to have user-selectable Caption display modes. Text display mode is optional;
- Caption and Text modes may contain data in either of two operating channels, usually referred to as C1, C2, T1, and T2;
- Receivers must decode at least C1 and C2 captions;
- Captions to be displayed in "boxes" on the screen within the Safe Title Area defined by SMPTE 27.3 (now replaced by SMPTE RP218-2002);
- Caption decoding circuitry must be tolerant of cable security systems that alter line numbering, etc.

The complete text of the *FCC Report and Order* (R&O) may be obtained from the U.S. Government Printing Office. The text was also published in the *Federal Register*, Vol. 56, No. 114, p. 27200. The FCC Rules and Regulations are contained in the *Code of Federal Regulations*, Part 47, Telecommunications. See Chapter 1.2 of this handbook, "Broadcast-Related Organizations and Information," for information on contacting the U.S. Government Printing Office and other organizations mentioned in this chapter.[1]

Update Since Passage of Decoder Circuitry Act

Since the passage of the Decoder Circuitry Act, the FCC has ruled several additions. These additions are documented with other technical details in a Consumer Electronics Association document CEA-608, titled *Line 21 Data Services* (formerly EIA-608). At the time of writing (2006), the current revision of this document is CEA-608-D.

The regulation and use of line 21 for captioning has been expanded to include both fields. Additional features have been added to deal with additional languages. Also, within field 2 is a capacity to deliver additional captioning services (C3, C4, T3, T4) in addition to extended data services (XDS). XDS includes,

[1]The entire Part 15 regulations, as updated February 16, 2006, may also be downloaded as a PDF file from http://www.fcc.gov/oet/info/rules/part15/part15-2-16-06.pdf.

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