



Challenges in the Migration of Analog Closed Captioning

By Justin Kovar, SMPTE 2010 Student Paper Award Winner

For video archivists, closed captions may be a hidden asset in your collection. If you have videotape that was recorded after 1976, you may have captions. This is because of the simplicity, robustness, and interoperability of closed captions. In analog recording, captions were hard to lose. With digital recording, the opposite is true, and captions can be lost in every step of the digitization process.

INTRODUCTION

It is easy to overlook closed captions when digitizing videotape. They were championed as a format in part because they were hidden or “closed” to viewers who weren’t looking for them, and therefore not a distraction.¹ This was in contrast to open captions, which were permanently embedded in the picture, much like subtitles “burned” into the image of a film. With analog recording, the hidden quality of closed captions was not a problem, since videotape recorders captured the entire TV signal, leaving closed captions intact whether or not the user was aware of it. The exception to this rule was the timebase correction (TBC) setting of some broadcast VCRs, which could strip out captions.² This analog problem continues in the digitization process, and is compounded by uniquely digital challenges.

With a little effort, captions can add value to your collection, making it accessible to hearing-impaired users, and adding searchable transcripts to your archives. In providing access to the hearing-impaired community, archivists help ensure that their collections are compliant with present and future disability acts, as well as institutional guidelines for what can be used in an academic setting. As video archivists there may also be a further ethical imperative for digitizing the captions in our collection. The Association of Moving Image Archivists’ *Videotape Preservation Fact Sheet* reminds us that, “The ethics of archival practice and of the conservation of cultural materials dictate that original information should not be altered or manipulated in any way.”³

A brief history of captioning may be helpful for surveying the likelihood of having captions in your collection. Captions were authorized for use by the FCC in 1976, and received their first major rollout on March 16, 1980, with ABC, NBC and PBS all broadcasting captioned programs on that day. The amount of captioning grew through the 1980s, and exploded after the Television Decoder

Circuitry Act of 1990, which ordered that all television sets larger than 13 in. needed to have a closed caption decoder. After the Telecommunications Act of 1996, which gave a mandate for closed captioning on television, captions were nearly ubiquitous by the year 2001.

Analog closed captioning (from now on called captioning) is carried in lines 21 and 284 of the NTSC broadcast signal, in an area of the picture called the vertical blanking interval (VBI), which is out of the viewable range of most televisions. *Media Access* writer Joe Clark describes it as “...the Swiss bank account of television, a hidden reservoir in which data can be banked.”⁴ If you could see the VBI, it would look like a black bar on top of the picture. On some tapes you may also see flickering white dots and lines at the point where the top of the picture meets the VBI. This is a visual clue that your tape has VBI, and possibly caption information.

Captions share space in the VBI with V-Chip television rating information, Vertical Interval TimeCode (VITC), Macrovision and CGMS copy-protection, as well as color burst information. Of these data, captions are one of the most likely to remain stable on tape, due to their purposely simple design: “The encoding system was designed to make the caption data as robust as possible, so that it can survive even in a poor reception area or on a VHS videotape.”⁵

ANALOG CHALLENGES: TIME BASE CORRECTION AND THE VITC

Time base correction (TBC) is a function included in many professional VTRs, and also available in standalone units. TBC fixes the unstable picture caused by jitter, or “...small but rapid variations in tape speed superimposed on the nominal play speed.”⁶ It accomplishes this by generating new VITC timecode information in the VBI. Generally, TBC greatly improves the picture from a videotape, but can also have the unintended consequence of stripping out existing VBI data, including captions. This is most likely caused by VITC, which shares space in the VBI with captions, but unlike captions is not standardized to a specific set of lines. A 1986 Patent Application filed by the Ampex Corporation details this problem:

“Although standards specify code formats for VITC information, the standards provide substantial flexibility as to placement of VITC information in vertical blanking intervals...Thus, in conventional



Figure 1. Captioning lost to TBC during the transfer process.

practice, the location of VITC information in terms of line addresses is highly unpredictable. One complication arising from such practice is that, during editing, VITC information may be recorded over important non-VITC information in vertical blanking intervals. For instance, an editor may inadvertently write VITC information over closed captioned information, causing loss or distortion of captions during replay of edited videotape.⁷ In my own experience digitizing from a Sony SVO-5800 deck, TBC has been the biggest factor in whether or not captions can be seen (**Fig. 1**). Many tapes would only show captions with TBC off, while a few only worked with TBC on. This poses a major problem for tapes that need TBC. While the TBC can be switched off, allowing captions to pass through, the picture would suffer for it, which puts the engineer in the awkward position of making a choice between picture quality and accessibility. In some VTRs this is fixable. The SVO-5800, for instance, has a built-in VITC regenerator, and menu settings that allow the user to adjust the blanking intervals of its timecode, and specify the lines that VITC will be written on. If this does not work, a standalone caption decoder like the MagHubcap can be used.⁸

DIGITAL CHALLENGES: CAPTURE CARDS AND FILE FORMATS

Although most professional video cards have the ability to read information from the VBI and record captions, configuration in the software is required to record beyond the visible signal. Once the captions are able to be “seen” by the software, saving them to a format that keeps the essence of the original captions while maintaining interoperability can be a challenge. There is no current standard for transcribing closed captions. In the National Information Standards Organization’s 2007 “Framework of Guidance for Building Good Digital Collections,” there are content categories for sound recordings, as well as “sound recordings with synchronized transcriptions,” but there is no listing for synchronized transcriptions in the content category of moving images/video recordings. The lack of standards was confirmed by Mary Watkins, Director of Communications and Outreach for the Media Access Group at WGBH.

Left unchecked, more than 100 file types have been used for saving captions, many borrowed from subtitling.⁹ The most interoperable

formats, such as .SRT, capture only the text of closed captions, omitting important accessibility information, such as screen placement, color of text, and speaker identification (**Fig. 2**). On the other end of the spectrum, Graphedit can be used to create a .RAW file with the complete unprocessed data from lines 21 and 284 of the VBI. While this format doesn’t lose caption information, it’s fairly complex to set up, and requires conversion to another format in order to be read.¹⁰ A real-world example of this can be seen in the Vanderbilt Television News Archive’s four-step process for extracting transcripts from captions:

...DirectX filters that capture signal from the VBI pin, send it through a decode filter, and write it to a file as raw closed caption data...[then] converts the binary raw closed caption file into the industry-standard Scenarist Closed Caption (SCC) format. This format is not human readable, so an additional program converts it into a Closed Caption Disassembly language, which includes the text and all the formatting directives...[A Perl Script] program strips out all the formatting directives, breaks the text into paragraphs based on the directive indicating a change of speaker, and divides the program into segments based on the closed caption sign for new topics.¹¹

An alternative approach was proposed by Josef Marc on the AMIA email list, who makes the case for digitizing the blanking intervals (the VBI and Horizontal Blanking Interval) for preservation copies: “...My goal is to give [future generations] as much as I can. So I leave in the black bars at the sides of the video (TVs hide these behind the cabinet face), and the VITC at the top. VITC is not something anyone wants to watch but as a SMPTE member I’m convinced that VITC will be legible probably forever.”¹² Marc’s approach is novel in that it does not rely on file formats, instead preserving all the VBI information from the original videotape, rather than trying to appraise what will and will not be valuable in the future.

EMERGING STANDARDS

The wait for digital caption standards may soon be over. In 2008, the SMPTE 23B working group began meeting with the goal of developing a standard for the display of broadband content, including work specifically on “establishing procedures for uniform captions, subtitles, and more.” The World Wide Web Consortium (W3C)



Figure 2. Caption positioning and speaker identification lost to .SRT format.

also recently suggested a Timed Text Authoring Format as part of its XML-based Distribution Format Exchange Profile (DFXP).

CONCLUSION

In the meantime, what should video archivists do about captions? The first step is to look for captions when digitizing video and confirm that your captions are not being stripped during playback. If captions are being lost, try adjusting the blanking interval in your VTR, or invest in a standalone caption decoder. It can be helpful to have a test tape with known captions, but the strength and quality of captions varies with the VTR originally used. Once your playback is displaying captions, make sure that your video card is capable of recording information from the VBI and set it do so. Finding a target format for saving captions requires some guesswork at this point, but erring on the side of saving more information and preserving the essence of the original captions is the safest strategy. Following these steps when digitizing videotapes ensures that you are not losing any caption information to the process, making the most complete transfers possible, and maximizing the audience for your archive.

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Kovar currently works as a digitization intern at the Texas Archive of the Moving Image. Recent projects and jobs include an appointment as Graduate Research Assistant for the University of Texas' Historical Music Recordings Collection, Digitization/Records Management for the University of Texas' College of Communication, creating a migration plan for synchronized ADATs during a Capstone for the UT Videogame Archive at The Dolph Briscoe Center for American History, as well as developing an annual summer video workshop for teens in the Bryan-College Station Public Library System.