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CINE-GT 3403: Video Preservation I
Assignment #1
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History of U-matic Tape

In 1969, the Sony Corporation developed a U-matic tape prototype. Sony, along with several other companies, established standards for the format in 1970 and by 1971, U-matic tape was introduced to the market. This was the first tape format to be in an enclosed videocassette format rather than the common reel-to-reel tape.

The tape was originally conceived to target the consumer market. However, high manufacturing costs and the price of the U-matic format deck made this format cost prohibitive for the general public. As result, the U-matic was marketed to the industry and professional sectors. The format become particularly popular in the broadcast industry in the mid-1970s, with the introduction of the Sony VO-3880 in 1974, as it enabled more portability in news gathering and reporting. Prior to this time, news organizations relied on 16mm film cameras for their news.

Technical Makeup

The U-matic (also known as 3/4" or quarter-inch tape) is a dual-reel enclosed in a plastic cassette with tape composed of a polyester base with magnetic particles, where the image and sound recording information is stored, and is enclosed in a plastic cassette. U-matic tape differs from other cassette tape formats since "the supply and take-up reels in the cassette turn in opposite directions during playback, fast-forward, and rewind: one reel would run clockwise while the other would run counter-clockwise. A locking mechanism integral to each cassette case secures the tape hubs during transportation to keep the tape wound tightly on the hubs."[1] The U-matic is a helical scan tape, meaning it diagonally wraps around the spinning heads in

[1] "U-Matic." Wikipedia. Wikimedia Foundation, September 9, 2019. https://en.wikipedia.org/wiki/U-matic.

the shape of the letter “U” – hence, the “U” in the name of the tape. The video signal information is captured diagonally across the width of the tape.

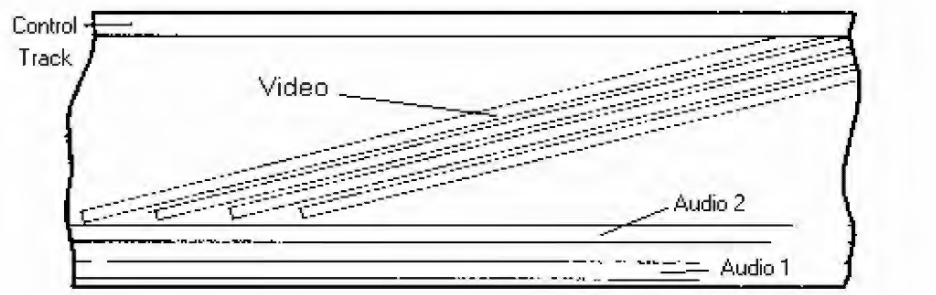

Figure 1 (https://www.nfsa.gov.au/preservation/preservation-glossary/helical-scan-recording)

The helical scan and larger width of the tape, ¾”, allowed for more images and sound to be captured on the tape. For these reasons, in comparison to other videocassette formats, the tape itself was more durable. However, the U-matic format is highly susceptible to sticky-shed syndrome, when the magnetic tape breaks down over time and the oxide on the tape begins to flake off from the tape base. This deterioration of the tape can clog the playback deck and leave debris on the video heads, thereby damaging other tapes. In many cases, playback of a tape with sticky-shed is impossible and remediation measures would need to be taken.

There are three different versions of U-matic tape: *Low-Band*, *High-Band,* and *Superior Performance (SP)*. These versions differ in the manner the subcarrier frequencies are used for luminance and chrominance recording. Within the three different versions of U-matic tape there are two sizes tape: a smaller sized tape (8 5/8 x 5 3/8 x 1/ 3/16) with run-time capacity of 20 minutes and a larger sized tape (7 ¼ x 4 5.8 x 1/3/16) with a run-time capacity of 60 minutes.[2] Low-Band was the original format of U-matic tape and became known as low-band after the introduction of High-Band (also known as Broadcast Video U-matic or BVU) in the early 1980s. High-Band increased the frequency of the chrominance (chroma) subcarrier and, as result, color

[2] Mariner, Matthew C. “What Do You Have? Evaluating Collections.” In *Managing Digital Audiovisual Resources. A Practical Guide for Librarians,* 16. Blue Ridge Summit: Rowman & Littlefield Publ., 2014.

resolution improved. As explained by author Vlado Damjanovski in the book “CCTV: Networking and Digital Technology:”

> “When color television was introduced it was based on monochrome signal definitions and limitations. Preserving the compatibility between B/W and color TV was of primary importance. The only way color information (chroma) could be sent together with the luminance without increasing the bandwidth was if the color information was modulated with a frequency that fell exactly in between the luminance spectrum components. This meant that the spectrum of the chrominance signal needed to be interleaved with the spectrum of the luminance signal in such a way that they do not interfere. This color frequency was called a **chroma sub-carrier**.” (emphasis mine)

With the introduction of the Superior Performance (SP) version of the U-matic in the mid-1980s, the subcarrier frequencies of the chrominance and luminance were increased resulting in a higher quality image, in relation to other U-matic tape versions. The signal-to-noise ratio (the desired signal versus the level of background noise) of a U-matic was also improved with the SP version.

U-matic Versions and Digitization

There are two primary challenges with the digitization of U-matic tape: obsolescence, and format compatibility. As noted earlier, U-matic tape is highly susceptible to sticky-shed syndrome and, given this is an obsolete format, it is a challenge to find playback equipment along with technical support to maintain and service equipment. In addition, playback of U-matic tapes is format specific. A low-band and high-band U-matic tape can only be played back in a standard deck. The image quality of a U-matic SP tape played back in a low-band deck will be lost: it will play back and white video only. It is therefore important to note, prior to digitization, the U-matic version to be digitized and ensure compatible U-matic playback decks are available.

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