

Video Reformatting Equipment and Workflow Steps

Important: Please note that these recommendations for equipment and processing are based on budgetary needs first, and then proximity to best practices given those budgetary constraints. For documentation on best practices, see *Sustainability of Digital Formats: Planning for Library of Congress Collections*.¹

Included in this document:

1. Analog to Digital VHS Tape Conversion
2. Analog to Digital Betamax, Betacam, BetacamSP, and U-Matic Video Conversion
3. Typical File Size

Please note: All equipment included in this are recommended as examples based on the experiences by partners in the Digital Library of the Caribbean using this equipment. This document should not be taken as an endorsement of any manufacturer's product. Those using this as a guide for their own purchases should be cautioned that equipment suited to each institution's specific needs, source materials, or fitness-for-purpose determinations may not be suited to another's. All prices are based on current estimates and are listed in USD.

¹ See *Sustainability of Digital Formats: Planning for Library of Congress Collections*, <http://www.digitalpreservation.gov/formats/content/video.shtml>

Analog to Digital VHS

Equipment:

S-VHS VCR with Hi-Fi, manual tracking, 2 heads and S-Video and RCA output, dubbing capability (need two decks for dubbing)

~\$500 - \$1300 (Recommended: Sony SVO-2000 S-VHS Videocassette Recorder
~\$2,000)

Video capture card for PC *OR* USB/Firewire video capture device

~\$90 - \$200 (Card); (Recommended cards: Happague Colossus HD ~\$159; or ATI All-in-Wonder HD ~\$150);

OR

~\$30 - \$150 (Capture device); (Recommended capture device: Plextor ConvertX PX-M402U ~\$130)

Software:

Prices vary. There are hundreds of video editors and capturers, some very costly and not very extensible; others are free and nearly professional-grade. Many capture cards and external devices come bundled with editing and capture software (ATI capture cards come with proprietary capture software that compresses to MPEG2 natively; while other devices compress in other codecs contained in AVI files).

Given the variables in proprietary software, it is often better to use freely distributed software that can interact with your capture device to produce a variety of file formats and codecs.

Recommended (free) video capture/editing software:

VirtualDub: packages various codecs in the AVI container. Proficient at packaging raw, uncompressed video and audio which are best kept as archival masters for storage and editing). Can do light editing.

OR

VirtualDubMod: can capture MPEG2 and OGG natively. Proficient at packaging raw, uncompressed video and audio which are best kept as archival masters for storage and editing). Can do light editing.

OR

Avidemux: Versatile with a user-friendly GUI. Can edit and export in various containers with various codecs.

Recommended (free) video encoding/playback software:

Super: can bulk transcode and contains multiple encoders with a GUI front end.

OR

VLC Media Player: can play almost any file format with almost any encoding; also effective as a transcoder

Installation:

1. Connect one end of red and white RCA cables to VCR's AUDIO OUTPUT.
2. Connect other end to capture device's AUDIO INPUT.
3. Connect one of S-Video (or yellow RCA) cable to S-Video or RCA to VCR's VIDEO OUTPUT.
4. Connect other end to capture device's S-VIDEO or RCA VIDEO INPUT.

Sample Workflow:

1. Turn on VHS
2. Insert tape into device and play it (viewing through your capture software) to assess its native quality and integrity.
3. Once satisfied, rewind tape and prepare your capture software for recording.
4. In VirtualDub, VirtualDubMod, or Avidemux, you will need to:
 - a. specify the input device (your capture device)
 - b. specify the file format for export after capture (preferably uncompressed YUY2, UYVY, or YVYU packaged as an AVI)
 - c. Begin capturing before beginning playback of tape in order to give yourself some lead-in for editing purposes.
 - d. Begin playback of tape.
5. Once capture is complete, it will (depending on software used) save to a preselected directory as the output file format specified earlier. Make 1 copy of the output to serve as an archival master, and make 1 additional copy to perform any necessary edits.
6. Make any necessary edits to the video file. With files transferred for preservation, often no edits are made.

7. Save the file in MPEG2 (H.262 codec) or MPEG4-4 (H.264 codec) file format, which serves well as an end-user product. The resolution should be, at its highest, at 720x480 (for analog video signals)
8. Using either the VLC or SUPER encoder, make derivatives from the edited source file in any containers or codecs deemed necessary.
 - a. Recommended service formats for distribution:
 - i. MP4/MOV (h.264 AVC + AAC audio)
 - ii. MPEG2-TS (MPG2 + MP3)
 - iii. WMV (WMV2 + WMA2)
 - iv. OGG (Theora + Vorbis or FLAC)
9. Direct users to open source media players like VLC Media Player that are capable of playing most file formats in most codecs.

Analog to Digital Betamax, Betacam, BetacamSP, and U-Matic Video Conversion

Please note: The equipment, software, and workflows are almost identical to VHS. VHS has been separated for readability because most institutions will only handle VHS in-house and will outsource conversion for these materials. If handling these in-house, the same equipment, software, and workflows used with VHS can again be used.

Equipment:

Betamax Player

Betacam Player

BetacamSP Player

U-Matic Player

Each of these playback devices plays a specific type of video tape and is no longer widely produced. Multi-format Betacam players are still manufactured by Sony but are prohibitively expensive (Sony J30SDI ~\$15,000). In most cases it is more cost effective to purchase used equipment or to borrow equipment if possible (in the case of U-Matic players, there is no other option).

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Recommended (free) video encoding/playback software:

Super: can bulk transcode and contains multiple encoders with a GUI front end.

OR

VLC Media Player: can play almost any file format with almost any encoding; also effective as a transcoder

Installation:

Betacam & BetacamSP:

Connect one end of red and white RCA cables to VCR's AUDIO OUTPUT; connect other end to capture device's AUDIO INPUT. Connect one of S-Video (or yellow RCA) cable to S-Video or RCA to VCR's VIDEO OUTPUT; connect other end to capture device's S-VIDEO or RCA VIDEO INPUT.

Betamax:

Most models have BNC outputs and will require BNC-to-S-Video or BNC-to-RCA cables in order for them to interface with your capture device. In any case, you will need to connect the player's VIDEO OUTPUT to the capture device's VIDEO INPUT; and the player's AUDIO OUTPUT to the capture device's AUDIO INPUT.

U-Matic:

Similar to Betamax, the video connections will probably be BNC. However, the audio connections will likely be XLR (3-pin), similar to the cables used for many

microphones. You will need an XLR-to-RCA audio cable in order to connect the player's AUDIO OUTPUT to the capture device's AUDIO INPUT.

Sample Workflow:

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3. Once satisfied, rewind tape and prepare your capture software for recording.
4. In VirtualDub, VirtualDubMod, or Avidemux, you will need to:
 - a. specify the input device (your capture device)
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Typical File Size

1 min. of uncompressed video @ 29.97fps, 24bit depth, and 220mbps ~ 1.695GB