COLLECTIONS AT RISK

Magnetic tape

VHS, BETACAM, U-MATIC

Introduction

This guide aims to assist small to medium collecting organisations and individuals to care for magnetic video tapes in their collections, specifically VHS, Betacam and U-matic video cassettes. The guide is not intended to replace the advice of a trained professional but provides the first steps in caring for magnetic tape collections. This guide can be used in conjunction with the other guides in this series: Digital, Film, Floppy disk and Optical disc.

The information provided in this guide includes terminology and names of technologies and processes that are complex and specific to the format in focus. For many these terms and names may be challenging to recognise or understand. Please don't be discouraged, definitions can be clarified by consulting with a conservator, professional service provider, GLAM sector agencies as well as the references and further reading provided in this guide.

Background

Magnetic tape comes in many forms and can include reel-to-reel spools, audio cassettes and video cassettes. This tape consists of a plastic backing, usually polyester, coated in a binder that holds magnetic particles on which signals are encoded. Playback involves the magnetic tape being drawn around a rotating head drum inside the video cassette recorder (VCR) and the signals converted into image and sound.

Assessment

When assessing your collection of magnetic tapes, ensure you have a clean workspace with enough room to carefully lay out the tapes as you assess them. Allow space to examine and document the tapes and have any necessary equipment ready before you begin. This may include an additional light source, a notebook and pencil or a computer to record your findings, and playback devices and a screen. It is recommended that you wear nitrile gloves when handling the tapes with care, and have masks and zip-lock plastic bags, should you suspect mould is present and need to isolate tapes.

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L-R: U-matic, Betacam and VHS tapes

Media and materials

These three types of magnetic tape are similar but can be identified by their size and recognisable features on the cassette:

- A VHS cassette is 18.7cm x 10.3cm x 2.5cm, with two windows to view the tape and a VHS logo on the flip-up guard.
- A Betacam cassette comes in two sizes: the small cassette is 15.6cm x 9.6cm x 2.5cm and the large cassette is 25.4cm x 14.5cm x 2.5cm. The small cassette has one window to view the tape and the large cassette has two windows. Both cassettes have a Betacam logo on the flip-up guard.
- A U-matic cassette comes in two sizes: the small cassette is 18.5 x 12 x 3 cm and the large cassette is 21.9cm x 13.7cm x 3cm. They have a window for viewing the tape and distinctive angular corners on the upper sides of the cassette.

Condition issues

Magnetic tape is inherently at risk of physical damage and chemical degradation. Hardware issues can also affect the rendering of image and sound and may also cause damage to tapes.

- Examine the cassette for signs of physical damage. Do not attempt to play tapes with a cracked or broken cassette.
- **Signal loss**, also known as dropouts, can be seen during playback as white or black spots, streaks, a snowy fuzz

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Magnetic tape with signs of physical damage

or no visible image. Dropouts can occur for several reasons including a defect in the tape, dirt or debris coming between the heads and the tape, a dirty head, or the instability or loss of the magnetic particles over time.

- **Binder hydrolysis** is a chemical reaction where the binder reacts with water and starts to deteriorate. Often called 'sticky-shed syndrome', binder hydrolysis causes the binder to shed off the backing and adhere to tape heads, which can damage the VCR and, in turn, other tapes if the VCR interiors are not cleaned. This issue is more commonly present in U-matic tape.
- Materials in the tape are susceptible to **mould growth** when exposed to moisture. This may be visible on the tape as brown or white thread-like growths or fuzzy areas.
- **Pollutants** such as dust and dirt, if allowed to build up inside VCRs, may scratch the tape during playback and cause signal loss.

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- **Pack slip** occurs when sections of the wound tape slip and cause an uneven edge of the pack. During playback the protruding edges can be damaged.
- **Hardware obsolescence** and availability of parts for the hardware is a significant issue. VCRs and other playback devices are becoming increasingly rare, as is the technical expertise for maintaining and servicing the equipment.

Handling

- Rough handling can contribute to potential pack slip and cassette damage. Avoid dropping the tape or making any jarring moves while handling the cassette.
- Do not touch the magnetic tape with your bare hands; the magnetic particles on the tape itself could be hazardous and the oils on your hands could damage the tape.
- If mould is present remember to use personal protective equipment. Isolate the mouldy items by sealing them in a plastic bag and seek advice from a professional service.

Preservation

A video cassette is often thought of as an everyday item that can withstand a lot of handling, however magnetic tape can be as fragile as other objects in your collection and should be treated with care. Risks usually associated with art and heritage object-based collections such as incorrect relative humidity (RH%) and temperature, light, pest activity, pollutants and storage conditions can all adversely affect magnetic tape. Good preventive conservation strategies will help to reduce these risks and assist in caring for your collection.

Preventive conservation

- To prevent pack slip, store the cassettes upright on their end like a book, on a metal shelf with a divider every so often to spread the load and to ensure the tapes do not lean.
- Never stack the tapes on top of one another; this can place stress on the lower cases and may distort the cassettes and the tape.
- Store the cassette in a case to prevent dust, reduce adverse environmental conditions and protect it from inappropriate handling practices. Cases should be made from acid-free materials; inert plastic cases made from polypropylene are recommended.

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- Ensure tapes are not stored near strong electromagnetic fields, including items such as speaker cabinets or fridge magnets. These can interfere with magnetic particles on tapes, which can lead to signal loss.
- Never leave the tape in a playback device and always eject at sections where there is no recording, for example at the start or the end of the tape. Avoid pausing the tape for long periods as this may stress the tape.
- Before playback and if the tape has not been played for a long time, it is advisable to fast-forward to the end and rewind back to the start to relieve any tension and improve the tape wind quality.
- If the tape is stored in different environmental conditions to where the tape is going to be played, allow the tape to acclimatise to its new environment before playback.

Tapes in storage

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- A metal cabinet in the middle of the building would be an ideal storage solution to act as a buffer against adverse and fluctuating conditions, and protect the tapes from dust.
- The following table indicates the recommended storage environment:

CONDITIONS	RECOMMENDED PARAMETERS
Temperature	18–21°C
Relative Humidity (RH%)	35–45 RH%
Light	Avoid direct sunlight and limit light exposure
Storage area	A dark, cool, dry, clean and stable environment

Potential treatment

Consider the need for any conservation treatment before attempting playback.

- Tape housed in a damaged cassette will need to be carefully transferred to a new cassette.
- Tapes exhibiting mould growth should only be cleaned by an experienced professional with adequate personal protective equipment.
- Tapes prone to binder hydrolysis can be baked in a controlled way to temporarily firm up the binder. This should only be performed by experienced professionals, as improper baking can cause significant damage.
- The heads within the VCR can be cleaned to remove any dirt, debris or sticky tape. Ensure the person cleaning the heads is trained to do so, and avoid using a commercial head cleaner tape, as incorrect cleaning can cause unnecessary damage or wear to the heads.
- Further advice can be sought through a conservator via the AICCM directory of conservators.

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Migration

Migration is a key method for ensuring ongoing access to video recordings on magnetic tape, by capturing the contents in a digital format, also known as digitisation. Consider using a professional digitisation service provider. There are several actions that can prepare your collection for digitisation:

- Choose which tapes you will digitise and create a priority list. Digitisation can be time consuming and expensive so perhaps not all tapes will be able to be digitised.
- Note the recorded duration or, if unknown, the total tape duration. This detail will be crucial in obtaining accurate quotes for digitisation.
- Check the condition of the cassettes and tapes to establish if any require treatment before digitisation.
- Are there any labels on the cassettes that are lifting and peeling off? These could get caught in the VCR. Either re-adhere or remove the labels, but remember to document any important information on the labels before they are removed. Thoroughly document any labels or markings that are important for the provenance of the tape.

Digitisation in action

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- Before commencing digitisation, consider what digital storage capacity is available. Uncompressed video file formats offer higher quality, though at a much larger file size than compressed formats.
- It's advisable to also make a preservation copy and an exhibition copy. Create backup copies in case of accidental loss or disaster and store copies in separate geographical locations.

Disposal advice

A tape that has suffered from sticky-shed syndrome, has been badly damaged or is severely degraded and beyond treatment may need to be disposed of. Some components of these tapes, such as the plastic cassette and internal components, can be recycled. However, the magnetic particles on the tape itself could be hazardous and should be handled by a professional. Check with your local council for an appropriate recycler near you.

References and further reading

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All photos by Matto Lucas. Captured onsite at ACMI in the Blackmagic Design Media Preservation Lab.