



# Conserve O Gram

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## Care Of Archival Digital And Magnetic Media

Basic procedures for the care of archival audiotape, videotape, and electronic (digital) magnetic tape are provided in this *Conserve O Gram*. See also *Conserve O Gram* 19/8, Preservation of Magnetic Media, for additional guidance on tape structure, degradation processes, and preservation recommendations.

To Care for Your Digital and Magnetic Media You Must Do This...	Don't Do This...
<p><b>Preserving Magnetic Media</b></p> <ul style="list-style-type: none"> <li>• Expect magnetic media to last 10 to 30 years when properly stored.</li> <li>• Remember that transcripts, scripts, and printouts can support, but not replace, original magnetic materials.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't play the preservation master or the original for reference.</li> </ul>
<p><b>Selecting Media</b></p> <ul style="list-style-type: none"> <li>• Back-up magnetic media onto longer-lived media.</li> <li>• Choose PET (polyethylene terephthalate or Mylar brand) tapes with iron oxide pigments, not metal particulate (mp) or chromium dioxide (CrO<sub>2</sub>) pigments.</li> <li>• Use reel-to-reel tapes, rather than cassettes for master copies.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't reformat originals onto audiotape cassettes, chromium dioxide tapes, floppy diskettes, and rewritable CD-ROMs.</li> <li>• Don't <i>sound engineer</i> preservation copies to remove ambient noise because the noise may contain information and atmospherics that increase the value of the recording.</li> </ul>
<p><b>Reformatting—How Many Copies</b></p> <ul style="list-style-type: none"> <li>• Produce three copies for all magnetic media: preservation masters, duplication masters, and reference copies.</li> <li>• Recopy magnetic media at least every five years.</li> <li>• Store copies separately.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't forget to store deteriorating originals, such as acetate-backed tape, separately from copies.</li> <li>• Don't forget to label all copies as such.</li> </ul>
<p><b>Prioritizing for Copies</b></p> <ul style="list-style-type: none"> <li>• Prioritize magnetic media for reformatting as described in <i>Conserve O Gram</i>, 19/10, Reformatting for Preservation and Access: Prioritizing Materials for Duplication.</li> <li>• Inspect and verify all copies after reformatting records and confirm that all data were copied.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't attempt to reformat deteriorated magnetic media yourself; hire professionals.</li> <li>• Don't use system back-up tapes as your preservation master.</li> </ul>

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<p><b>Storing Digital and Magnetic Media</b></p> <ul style="list-style-type: none"> <li>• Store originals at 5°C (40°F) ±2° and 20% RH ±2%, no lower.</li> <li>• Keep usage copies at 15-23°C (60-74°F) ±3° and 25-55% RH ±10%.</li> <li>• Allow the media to acclimatize in its sealed container if storage and usage areas vary more than 15°F warmer or cooler: 4 hours for every 15°F difference.</li> <li>• Keep media away from magnetic fields (including machinery motors), high temperatures and RH, smoke, food, and light exposure in secure storage.</li> <li>• Remember that media stored at high humidities can become sticky or moldy and leave a residue on the recorder.</li> <li>• Avoid storing tapes at high, low, or cycling temperatures because they can stretch or become deformed.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't store media flat (horizontally) or outside of their containers.</li> <li>• Don't store media for long periods (more than 5 years) without copying and verifying the copies.</li> <li>• Don't store media without air conditioning to filter out damaging pollutants.</li> <li>• Don't store original acetate-backed tape with other media; instead place it in a Ziploc bag within a frost-free freezer after copying.</li> <li>• Don't store media where it will suffer shock, such as on mobile shelving.</li> </ul>
<p><b>Retensioning (Rewinding or Refreshing)</b></p> <ul style="list-style-type: none"> <li>• Rewind magnetic tape at a controlled tension and speed on a regular basis (every 3 years). This redistributes tape stresses and avoids tape sticking and transfer of information from one layer to another.</li> <li>• Leave and store tapes in a <i>tails out</i> or not-rewound format after playing.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't rewind tape at high speeds or under great pressure.</li> <li>• Don't leave a jagged tape pack with tape sticking up or indented within the pack.</li> </ul>
<p><b>Handling</b></p> <ul style="list-style-type: none"> <li>• Avoid handling original magnetic media.</li> <li>• Use copies of media for reference and other projects.</li> <li>• Wear clean, lintless cotton gloves when handling the media.</li> <li>• Return media to their containers when not in use.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't play original media; use copies.</li> <li>• Don't handle tape roughly; most tape failure is physical, due to thin, weak media and poor handling.</li> </ul>
<p><b>Transporting</b></p> <ul style="list-style-type: none"> <li>• Package valuable original magnetic media on edge in bubblewrap, if you must transport them.</li> <li>• Deliver original magnetic media by hand instead of mailing or shipping.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't ship original tapes through the mail, UPS, or FedEx.</li> </ul>
<p><b>Maintaining Playback Equipment</b></p> <ul style="list-style-type: none"> <li>• Maintain playback equipment in perfect condition, paying attention to head alignments and tape drives.</li> <li>• Clean equipment regularly, particularly playback and recording areas.</li> <li>• Clean the heads if tapes begin squeaking, jerking, or jumping in the equipment when played. Copy the tapes immediately.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't use originals for reference.</li> <li>• Don't play media on dirty, damaged, or out-of-sync playback equipment as it can scratch media, distribute dirt across the media surface, tear or stretch media, and produce poorly wound tape packs that stress media.</li> </ul>

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<p><b>Maintaining Copies of Hardware/Software</b></p> <ul style="list-style-type: none"> <li>• Obtain two of any essential equipment.</li> <li>• Maintain current versions of software and transfer (migrate) the media as necessary because much software has limited backward compatibility.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't forget to maintain software and hardware for electronic records so that you can use your copies in future.</li> <li>• Don't play original media.</li> </ul>
<p><b>Cleaning Tapes</b></p> <ul style="list-style-type: none"> <li>• Clean the outer surface of the tape pack.</li> <li>• Have the tape cleaned by a professional recommended by the National Media Laboratory (Building 235-B-30, St. Paul, MN 55144; Internet at <a href="http://www.nml.org">http://www.nml.org</a>), if there is dust, dirt, or mold between the layers of a tape; or use a tape winder/cleaner at a slow speed.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't unwind tapes for cleaning unless essential; instead clean the outer surface of the tape pack.</li> <li>• Don't use magnetic media cleaners frequently (weekly).</li> </ul>
<p><b>Identifying Common Preservation Problems</b></p> <ul style="list-style-type: none"> <li>• Be aware that magnetic media fail most commonly for the following reasons: <ul style="list-style-type: none"> <li>- high curl of the tape causes the tape not to run through the equipment</li> <li>- high friction due to tape stickiness causes the tape not to run through the equipment</li> <li>- tape adhesion failure (the oxide information layer falls off)</li> <li>- tape cohesion failure (the binder sheds and flakes off)</li> <li>- head build-up due to flaking binder building up on tape heads and destroying the signal</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Don't forget to control the tape storage environment, rewind tape packs smoothly and slowly, and keep tapes in a cool, dry area.</li> <li>• Don't use system back-up tapes as your preservation master.</li> </ul>
<p><b>Recovering from Disaster</b></p> <ul style="list-style-type: none"> <li>• Hire a private contractor to attempt a data retrieval and recovery operation if damaged older electronic or magnetic records must be salvaged; or bring in experts, such as the National Media Laboratory, to assist with the process.</li> <li>• Avoid all high (&gt;21°C [70°F]) or low temperature (&lt;5°C [40°F]) disaster recovery procedures because they may lead to tape stretching or distortion.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't forget to put magnetic media salvage and recovery into your Emergency Operation Plan.</li> <li>• Don't ignore possible assistance during salvage operations from local experts, such as state libraries and archives with conservators.</li> </ul>
<p><b>Recovering from Floods</b></p> <ul style="list-style-type: none"> <li>• In an emergency, air dry, dehumidify, or vacuum dry magnetic media.</li> <li>• If tapes are contaminated with water, use soapy water at room temperature to remove debris, then rinse with distilled water and air dry.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't freeze dry, vacuum thermal dry, or vacuum freeze dry magnetic media in case of an emergency; instead air dry, dehumidify, or vacuum dry them.</li> </ul>
<p><b>Recovering from Organic Contamination</b></p> <ul style="list-style-type: none"> <li>• If contaminated with organic debris, immerse the tape in tap water, rinse in a mild (10%) HCl solution, rinse in tap water, rinse in distilled water, and air dry. Avoid all rapid changes in temperature.</li> <li>• Use professionals in the disaster salvage and recovery process. Contact the National Media Laboratory.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't air dry tapes in high humidity environments or spaces with mold or direct sunlight.</li> </ul>

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<p><b>Recovering from Mold or Smoke Damage</b></p> <ul style="list-style-type: none"> <li>• Clean a tape if it becomes moldy or smoke damaged, copy it, transcribe it, and then clean the copier.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't allow smoke or mold damaged tapes to sit uncleaned and uncopied. Copy them fast.</li> </ul>
<p><b>Recovering from Sticky-Tape Syndrome</b></p> <ul style="list-style-type: none"> <li>• Ask for conservation help in <i>tape baking</i> if tapes become sticky due to high humidity.</li> <li>• Bake a reel-to-reel audio, video, or computer tape to decrease stickiness and allow copying by placing the tape in a 122°F oven for 8 hours to temporarily firm up the sticky binder. Copy the tape within three days of baking.</li> </ul>	<ul style="list-style-type: none"> <li>• Don't forget to immediately copy valuable acetate-backed tapes (may smell like vinegar and light can be seen through the tape windings); paper-based tapes; brittle, flaky, or sticky tapes; and tapes that have damaged edits.</li> </ul>

**References**

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