First Nations Media Australia
Archiving Resources

Some common types of AUDIO archival media, their storage requirements and preservation risks

Format	Risk level[1]	Page
¼" Open Reel	High risk of loss	2
Compact Cassette	High risk of loss	3
Continuous Loop Cartridge (Cart)	High risk of loss	5
8 Track	High risk of loss	6
Microcassette	High risk of loss	7
Digital Audio Tape	High risk of loss	8
Digital Compact Cassette	High risk of loss	9
Compact disc (CD)	Moderate risk of loss	10
MiniDisc (MD)	High risk of loss	11
DVDs	See Video formats	

[1] The level of risk is a general assessment only. Situations of poor storage conditions, tape or recording surface damage, lack of access to players all change the risk assessment for individual media or a range of media. The risk level given here is an estimate based on good storage, the quality of the tape's or recording medium's physical condition and the market availability of players.

¼” Open Reel 1935-1980s

Magnetic tape (acetate, paper, polyester, or PVC) on a hub or reel

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
¼” open reel audio is the earliest type of magnetic tape-based recorded sound format. The tape is composed of magnetic particles, binder, and a base of either acetate, paper, polyester, or PVC. The quarter-inch size, which was the standard width of open reel tape until the 1950s, is the most common open reel tape width. Cellulose acetate was the most common tape base during the 1940s and 1950s. Acetate bases can be differentiated from polyester bases by conducting a quick light test. Hold the reel up to a light source - if light "pipes" through, the base is most likely acetate. Reel size can vary, measuring from 2 or 3 inches to 10.5 inches in diameter (14-inch diameters are also possible), with 5, 7, and 10.5 inches also common.	¼” open reel audio is susceptible to risks associated with age, hardware, and equipment obsolescence. Like other types of magnetic media, it is prone to risks such as mould, binder deterioration, physical damage, signal drop-outs, and, in the case of acetate-based tapes, base deterioration. ¼” tape may be thinner and more fragile than other kinds of tape, and it is more susceptible to stretching and breaking during playback. **Due to media and hardware obsolescence, this format should be considered at high preservation risk.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Humidity** 30-50% relative humidity Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Store all magnetic tape vertically on end, inside its case. Stacking any tape format horizontally--or even allowing it to lean for too long--can compromise a tape pack and cause warping. Its container should provide hub support for the reel in order to preserve the pack and prevent distortion. Use unslotted reels if possible	Never touch the surface of a magnetic tape recording. Handle by the hub instead. Do not pull on the tape or squeeze the reel flanges. This places stress on the tape, potentially causing distortion and damage. Never leave media in a playback machine; always return to storage enclosure when not in use.. Acid-free archival hold-down tape should also be used to secure loose ends of the open reel tape. Whenever feasible, replace original cardboard containers as they are typically non-archival (i.e. acidic) and have little or no hub support.	Reel-to-reel audio playback equipment and media are becoming scarce, although there are a few manufacturers that are still filling the needs of professional audio studios. In order to play back a tape properly, you must know the tape track configuration and recording speed. In addition to the proper playback head configuration, playback equipment must have a tape transport able to support the tape's full width in order to read all the tracks encoded on it.

Compact cassette 1963 – 1990s

Polyester magnetic tape enclosed in a plastic cassette.

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Compact cassette is a magnetic tape-based recorded sound format. The tape is composed of magnetic particles or pigment, binder, and a polyester base. Cassettes are composed of ⅛ inch plastic pigment-coated recording tape wound around two internal reels and housed in a plastic enclosure. Ferric oxide is the most common pigment; other pigments include chromium dioxide, metal particle, and metal evaporated tape. Cassette dimensions are approximately 4" × 2½" × ½". The track	Magnetic tape is susceptible to physical, biological, and chemical risks like stretching, breaking, drop-outs, improper wind, mould, binder deterioration, and unintended recording. Compact cassettes with tape lengths of longer than 90 minutes are especially prone to print-through, stretching, and breaking as the tape is thinner than shorter length tapes. Frequent playback wears on the media and degrades the sound quality over time. This medium is especially susceptible to damage from playback as it may jam in the playback deck and be "eaten," which can cause crimping and breaking during playback. Internal cassette elements	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	The best orientation for a cassette is vertical on its end, like books on a shelf. Have dividing supports every 100mm-150mm. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion.	Engage the record protection mechanism if it has not already been done. Cassette boxes should have projections to lock the hubs and prevent movement. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use.	Noise reduction technologies were developed in order to reduce the noise or tape hiss commonly found on thinner tapes recorded at slow speeds. Noise reduction technologies most commonly found on compact cassettes are Dolby (B, C, and S) and dbx (Type II). If a tape has been recorded using noise reduction, the playback equipment must have corresponding noise reduction capabilities in order to accurately play back the tape content.

configuration is often four-track stereo, where tracks 1 and 2 compose "Side A" and tracks 3 and 4 compose "Side B."	like pads and rollers are susceptible to damage. Cassette housings can be repaired and replaced in the event of damage. **Due to media and hardware obsolescence, this format should be considered at high preservation risk.**				

Continuous Loop Cartridge (Cart) 1959-late 1990s

Polyester magnetic tape enclosed in a plastic cassette

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Continuous loop cartridge (cart) is a magnetic tape-based recorded sound format, and it is the 4-track precursor to the 8-track cartridge. The tape is composed of magnetic particles or pigment, binder, and a base. Carts are composed of ¼ inch plastic oxide-coated recording tape wound around a single internal reel and housed in a plastic enclosure. Although carts appear similar to an 8-track, they are distinctly different and are identifiable by a fairly large hole in the lower left backside of the cartridge. Cartridge dimensions are generally 133mm × 101mm × 23mm (NAB A type) but can be found in both smaller and larger sizes (NAB type B and C) depending upon end use and tape length.	Magnetic tape is susceptible to physical, biological, and chemical risks like stretching, breaking, drop-outs, mould, and binder deterioration. Additionally, carts are subject to binding and tension problems due to binder lubrication and wind issues. **Due to media and hardware obsolescence, this format should be considered at high preservation risk.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity	The best orientation for a cassette is vertical on its end., like books on a shelf. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion. Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Engage the record protection mechanism if it has not already been done. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Furthermore, never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use	As carts have been largely replaced by digital technology, the media and its related playback equipment are largely obsolete. Although most carts resemble a commercial 8-track cartridge, they cannot be played back on an 8-track machine.

8-Track 1964 – early 1980s (also known as Stereo 8)

Polyester magnetic tape enclosed in a plastic cassette.

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
The 8-track cartridge (or Stereo 8) is a magnetic tape-based recorded sound format that was used exclusively for commercially releases. As a result, its content is likely not unique. The tape is composed of magnetic particles or pigment, binder, and a polyester base. Ferric oxide is the most common pigment; other pigments include chromium dioxide, metal particle, and metal evaporated tape. Cartridge dimensions are generally 5¼" × 4" × ⅘" with a tape width of ¼".	As with other magnetic media, 8-tracks are susceptible to physical, biological, and chemical risks like stretching, breaking, drop-outs, improper wind, mould, and binder deterioration. The format is also especially susceptible to tape binding due to lubrication loss and jamming in the playback machine. **Due to media and hardware obsolescence, this format should be considered as a high preservation risk.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity	The best orientation for a cassette is vertical on its end, like books on a shelf. Have dividing supports every 100mm-150mm. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion. Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Engage the record protection mechanism if it has not already been done. Cartridge cases should have projections to lock the hubs. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use.	8-track tapes require format-specific equipment for playback. The audio is recorded and played back in two-channel stereo with a tape track configuration of eight tracks, each in its own channel going in the same direction, making 4 sides. Since the tracks are so thin and close together and because the playback heads move between the pairs of tracks, the heads often become misaligned. When this misalignment occurs, echoes of adjacent tracks may be heard during playback.

MICROCASSETTE 1969–early 1990s

Polyester magnetic tape enclosed in a plastic cassette.

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HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Microcassette is a magnetic tape-based recorded sound format. The tape is composed of magnetic particles or pigment, binder, and a polyester base. Ferric oxide is the most common pigment; other pigments include chromium dioxide, metal particle, and metal evaporated tape. Cassette dimensions are approximately 1 ⅞" × 1 ¼" with a tape width of approximately ⅛.	Since the tape is extremely thin, microcassettes are especially prone to breakage and stretching. As with other magnetic media, microcassettes are susceptible to physical, biological, and chemical risks like stretching, breaking, drop-outs, improper wind, mould, binder deterioration, and unintended recording. Frequent playback wears on the media and degrades the sound quality with each playback over time. This medium is especially susceptible to damage from playback as it may jam in the playback deck and be "eaten," which can cause crimping and breaking during playback. **This format would be considered high risk of loss.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity	The best orientation for a cassette is vertical on its end, like books on a shelf. Have dividing supports every 100mm-150mm. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion. Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Engage the record protection mechanism if it has not already been done. The cassette case should have projections to lock the hubs. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use.	Microcassettes require format-specific equipment for playback.

DIGITAL AUDIO TAPE (DAT) 1987 – mid 2000s

Polyester magnetic tape enclosed in a plastic cassette.

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Digital Audio Tape (DAT) is a digital magnetic tape-based recorded sound format. The tape is composed of magnetic particles or pigment, binder, and a polyester base. Ferric oxide is the most common pigment; others include chromium dioxide, metal particle, and metal evaporated tape. The dimensions of the shell are 73mm × 54mm × 10.5mm with a tape width of 4mm.	The lifespan of the cassette is dependent upon numerous factors: the quality of the original tape, the type and condition of the machine on which it is played, the amount of care the tapes are given, how often they are played, and how they are packaged. DAT has known playback problems that are typically related to mechanical alignment. DAT is not an archival format. **This format would be considered high risk.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity	The best orientation for a cassette is vertical on its end, like books on a shelf. Have dividing supports every 100mm-150mm. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion. Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Engage the record protection mechanism if it has not already been done. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use.	DATs must be played back on format-specific equipment..

DIGITAL COMPACT CASSETTE (DCC) 1992 – late 1990S

Polyester magnetic tape enclosed in a plastic cassette.

Each item should have its own PAT compliant enclosure to protect it from dust, handling damage, and changes in environmental conditions. Store the items in Inert plastic containers to protect from dust, pests and airborne contaminants. An enclosure must be truly clean in order to protect the fragile tape surface. Dust and dirt abrasions can affect sound quality and even render the tape unplayable. Mouldy, damaged, and dirty containers must be replaced.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Digital Compact Cassette (DCC) is a magnetic tape-based moving image format. The tape is composed of magnetic particles (chromium dioxide- or cobalt-doped ferric-oxide), a binder, and a polyester base. DCC uses PASC (Precision Adaptive Sub-band Coding) compression in order to store the amount of information required for CD-quality sound on an audiotape. The cassette cartridge and tape width is the same as an analog compact cassette (approximately 4" × 2½" × ⅛" with a ⅛" tape). The cassettes look similar to analog audio cassettes except they only have access holes for the transport hubs on one side. Also, the tape path is shielded by a metal slider similar to those found on a 3.5 inch floppy disc.	The lifespan of the cassette is dependent upon numerous factors: the quality of the original tape, the type and condition of the machine on which it is played, the amount of care the tapes are given, how often they are played, and how they are packaged. **This format would be considered high risk.**	**Temperature** **Ideal** 4.5-12 degrees Celsius **Acceptable** 18-24 degrees Celsius **Humidity** 35-45% relative humidity	The best orientation for a cassette is vertical on its end., like books on a shelf. Piling tapes one upon the other tends to stress the cassettes at bottom; and over time, this can cause the plastic housing to warp and even crack. Allowing cassettes to lean for too long in poor storage environments can lead to distortion. Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodized aluminium are preferred.	Engage the record protection mechanism if it has not already been done. Do not attempt to open a tape cassette/cartridge--this is likely to cause greater damage unless you know what you are doing. Furthermore, never touch the magnetic tape surface. Keep magnetic media away from stray electromagnetic fields and avoid devices with a motor or transformer, both of which generate an alternating magnetic field. Never leave media in a playback machine; always return to storage enclosure when not in use.	DCCs must be played back on format-specific equipment. DCC playback machines were backward-compatible; they supported playback for analog cassettes as well as DCC

COMPACT DISC (CD) 1982 – present

Polycarbonate plastic disc substrate coated with a thin, reflective "data layer" composed of metal (commercial CDs) or dyes (recordable, rewritable CDs)
Inert plastic containers with a non-damaging centre hub are recommended. Original packaging for optical media can be less than desirable as the hubs may be too large or require excessive pressure to be applied in order to remove the disc.

MODERATE RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
Compact Disc (CD) is a digital optical disc format that can hold a variety of digital material, including recorded sound and moving image. Data capacity, however, prevents the storage of extremely large movie files. CDs are the same dimensions as DVDs: 120mm diameter and 1.2mm thick. Content is only stored on one side of the disc. The amount of content on the disc depends on how the content is compressed; if the data is heavily compressed, more data will fit on the disc. Some discs are recordable (CD-/+R), and some discs can be written, erased, and recorded multiple times (CD-RW).	Most CD damage is incurred through poor storage and handling. Surface scratches, gouges, and smudges can inhibit playback of the disc. If the seal encasing the aluminium recording surface is somehow compromised, the aluminium layer can oxidize, resulting in data loss. Data on CDs, especially non-replicated, recordable/rewritable CDs, is subject to loss over time. **This format would be considered moderate risk.**	**Temperature** **Ideal** 7-12 degrees Celsius **Acceptable** 13-20 degrees Celsius **Humidity** 30-50% relative humidity Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodised aluminium are preferred.	Like other types of discs, optical media should be stored vertically on end, inside a case.	Avoid touching the surface of the information side—what may be thought of as the underside of the disc; handle through the core hub and at the edge. Never leave media in a playback machine; always return to storage enclosure when not in use.	CDs must be played back on format-specific equipment. Over time the availability of CD players is decreasing.

MiniDisc 1992 – around 2013

Magneto-optical disc (ferromagnetic material under plastic layer) enclosed in a plastic cartridge with a sliding door

Inert plastic containers are recommended.

HIGH RISK OF LOSS

Description	Deterioration & Risk Level	Storage Environment	Storage orientation	Handling & Care	Playback Equipment
MiniDisc is a digital recorded sound format. It uses similar encoding technology as CD, although the disc is enclosed in a cartridge measuring approximately 7cm square. There are two distinct types of MiniDisc: Pre-recorded, which is very similar to CD in operation and manufacture, and Recordable MDs, which can be recorded repeatedly and employ magneto-optical technology.	Information encoded on MiniDiscs is stored in a compressed format. As MiniDiscs are recorded, the data stream is compressed. Audio quality begins to degrade when subsequent copies are made and the disc undergoes multiple re-compression. Thus, any copies—even digital copies—made from MiniDiscs are not true clones. They will be more compressed than the master disc and have lower audio quality. **This format would be considered high risk.**	**Temperature** **Ideal** 7-12 degrees Celsius **Acceptable** 13-20 degrees Celsius **Humidity** 30-50% relative humidity Wood cabinets should be avoided. Enamelled steel, stainless steel, or anodised aluminium are preferred.	Like other types of discs, optical media should be stored vertically on end, inside a case.	Avoid touching the surface of the information side—what may be thought of as the underside of the disc; handle through the core hub and at the edge. Never leave media in a playback machine; always return to storage enclosure when not in use.	MiniDiscs must be played back on format-specific equipment. Over time the availability of MiniDisc players is decreasing.