

BD TAPE HANDLING GUIDE

Magnetic tape cartridges are sensitive storage media that require careful handling to avoid data loss. Here's a guide on how to properly handle magnetic tape cartridges:

Topics in this guide:

- 1) Cartridge Receiving/Unpacking
- 2) General Cartridge Handling Procedures
- 3) Cartridge Lifetime Guidelines
- 4) Archive requirements for Long Term Retention
- 5) Tape Cartridge Care & Handling Quick-Tips
- 6) About Cleaning
- 7) Best Practices Summary



1) CARTRIDGE RECEIVING/UNPACKING

- Upon receiving the shipment, carefully inventory and inspect it. If any cartons are damaged or items are missing, immediately note these issues on all copies of the carrier's delivery receipt. If the packaging appears inadequate for protecting the cartridges from damage, notify your vendor right away.
- If the cartridges require acclimation, do not unpack them immediately. Acclimation involves allowing the cartridges to gradually adjust to the operating environment over a period of up to 24 hours before use.
 - First 8 hours: Keep the cartridges in their original packaging.
 - Next 8 hours: Unpack the cartridges and inspect them for any damage. If you find any damage, retain all packaging materials as evidence for a claim.
 - Final 8 hours: Remove the cartridges from their protective cases.

2) GENERAL CARTRIDGE HANDLING PROCEDURES

- Before inserting a cartridge into a drive, inspect it to ensure it is clean and undamaged.
- If a cartridge is dirty or damaged and you have no other information source but still need to use it, mount it once to copy the data onto a new cartridge.
- Avoid dropping the cartridge; if it is dropped, immediately transfer the data to another cartridge and then retire or destroy the dropped one.
- Ensure the leader pin is securely seated, and keep cartridges away from dust and debris.
- Avoid storing them near copiers, printers, or shipping and receiving areas.
- Keep cartridges at least 8-12 cm away from high-current power cables, power supplies, or motor generators, as exposure to strong magnetic fields can erase recorded media.
- The operating temperature should be maintained between 10°C and 45°C (50°F to 113°F), with relative humidity levels between 10% and 80%.
- Never degauss the cartridges, as this will erase the servo tracks, rendering the cartridge unusable.
- Avoid touching the tape surfaces, as fingerprints can cause greater head-to-tape separation, leading to signal loss.

3) CARTRIDGE LIFETIME GUIDELINES

- If a cartridge encounters a permanent error on more than one drive, promptly copy the data to a new cartridge.
- As a general guideline, if an unrecoverable error occurs more than twice on a single device or on multiple devices, the cartridge should be retired.
- Additionally, cartridges should be retired after approximately 350 read/write cycles, assuming no full-capacity reads or writes have been performed. Refer to the table* below for estimated cartridge lifespan.

BD TAPE HANDLING GUIDE

LTO Generation	Total End to End Passes	# Passes for full Capacity	Number of full Capacity Read/Writes	Years of Life at 1 full capacity write/week
LTO-6	20.000	136	147	~3
LTO-7	20.000	112	178	~3.5
LTO-8	20.000	168	119	~2
LTO-9	20.000	208	96	~2

- For daily utilisation, exchange cartridges at least every 1 to 2 years.

4) ARCHIVAL REQUIREMENTS FOR LONG TERM RETENTION

- When considering a datasheet's claim of a 30-year archival life, it's important to account for environmental conditions.
- Research indicates that the operating and storage environments significantly impact the amount of debris generated. High temperature and humidity can increase friction, leading to more debris. Conversely, media stored in very low humidity (dry conditions) also tends to generate more debris.
- To maintain the integrity of archived media, storage areas should be clean and free from dust and contaminants. Media should be stored in a vertical position.
- For optimal archiving:
 - Temperature: Maintain an archive temperature between 16°C and 25°C (61°F to 77°F). For short-term archiving (less than 6 months), temperatures up to 35°C (95°F) are acceptable.
 - Humidity: The archive should maintain a humidity level between 20% and 50%. For short-term archiving, levels up to 80% non-condensing are permissible.
 - Wet Bulb Temperature: Ensure the maximum wet bulb temperature does not exceed 26°C (79°F) for the entire system. Refer to the table below for acceptable temperature and humidity combinations (indicated in green).

wet bulb temp [°C]		environmental temperature [°C]							
		35	32	29	27	24	21	18	16
relative humidity [%]	20	19	17	16	13	12	10	8	6
	30	22	19	18	16	14	12	10	8
	40	24	22	20	18	16	13	11	9
	50	26	24	22	19	17	14	12	10
	60	28	26	23	21	19	16	14	11
	70	31	28	26	23	20	17	14	
	80	32	29	27	24	22	19		

5) TAPE CARTRIDGE CARE & HANDLING QUICK-TIPS

Environmental Issues

- Allow cartridges to acclimate for a minimum of 24 hours before use.
- Operate them in a clean environment, ensuring that the relative humidity is maintained between 30% and 50%, with the temperature ranging from 16°C to 32°C.
- Keep cartridges protected from moisture, dirt, and direct sunlight.

Storage Issues

- Keep cartridges in their boxes until ready for use and store them away from dust-generating sources like printers, copiers, and unpacking areas.
- Ensure cartridges are kept away from high-current cables, power supplies, motors, and generators to avoid data loss due to magnetic fields greater than 40 gauss.

BD TAPE HANDLING GUIDE

Transporting Cartridges

- Use cases that prevent cartridges from colliding with each other or hard surfaces.
- Ensure tapes are positioned to prevent any movement inside their cases.
- Carry a minimal number of tapes at a time to reduce the risk of accidental drops.
- Avoid rapid changes in temperature or humidity.
- Keep cartridges away from large motors and high-voltage lines that generate strong magnetic fields.
- Always use the original manufacturer's packaging or equivalent. Include adequate shock-absorbing material, ensure proper support to prevent movement, and orient cartridges with the tape reel axis horizontal inside the box.
- Never drop cartridges.

Handling Issues

- The deeply recessed label area on the cartridge cover allows for stacking, but only stack cartridges up to a maximum of 6 high.
- Use the write protect feature on all cartridges to safeguard data that should not be overwritten. Verify if writing permissions need to be re-established.
- Do not insert damaged or dirty cartridges into a drive, as this may damage the drive. Consult a hardware service engineer before using any questionable cartridge.
- When moving cartridges within the library, use a carrier that prevents cartridges from touching each other and limits their movement.
- Do not open cartridges under any circumstances.

6) ABOUT CLEANING

Importance of a Clean Environment

The LTO cartridge contains between 846 meters and 1,035 meters of tape media wound on a hub and enclosed in a hard plastic shell. Any dust or contaminants can enter the tape pack through the opening, especially when the cartridge is loaded into the drive. Such particles can cause problems for both the tape and the drive. Therefore, everything the LTO tape cartridge comes into contact with—such as the tape drive, cartridge handling automation, carriers, transport containers, and the operating and storage environments—must be free of dust and contaminants.

Cleaning Cartridges

To maintain cleanliness, cleaning cartridges are essential. All drives require cleaning cartridges as part of their routine maintenance. Since cleaning cartridges have a limited lifespan, it is recommended to replace them after at least 50 uses.

Cleaning Indication

LTO drives automatically indicate when cleaning is needed based on usage and read/write errors. Indicators, such as an LED light or a "C" on the display, will signal when cleaning is required. Cleaning should only be performed when these indicators are present.

Cleaning and Tape Automation

Most autoloaders and tape libraries have a dedicated slot for cleaning cartridges, allowing for automated cleaning when the drive requests it. This slot can also be configured for additional data cartridges if there are no capacity issues. It is advisable to keep this slot reserved for cleaning cartridges to maximize automation convenience.

Software vs. Hardware Based Cleaning

When a tape drive requests cleaning, tape automation systems can perform the cleaning automatically. If cleaning is managed by backup or archival software, which often includes media management and cleaning functions, the cleaning process can also be initiated via software. This method is recommended because it records cleaning events in the software's log, which is typically more accessible than extracting information from the tape library.

BD TAPE HANDLING GUIDE

Cleaning Guidelines

- Clean the drive only when prompted by the drive's indicators.
- Maintain a cleaning cartridge in an autoloader or tape library.
- If supported, use software based cleaning
- Replace the cleaning cartridge after 50 cleaning cycles.
- Keep the environment clean
 - Ensure that any carrier, rack, or shipper in contact with cartridges is free of dust and contaminants.
 - Periodic schedules for cleaning carriers, racks, and shippers should be implemented.
 - Data centres that house LTO media and drives should isolate copiers, printers, food, and drinks away from the media and drives.
 - Operations that are heavily dependent on packaging or unpacking cardboard boxes, or other debris-generating materials, should keep this activity outside of the data centre.
 - Inspect all cartridges for debris before loading them into drives or automated handling equipment.

7) BEST PRACTICES SUMMARY

- **Environmental Protection:** Avoid exposing cartridges to extreme or uncontrolled environments. If harsh conditions are unavoidable, plan for acclimation time. Always inspect tapes before inserting them into a drive or robot.
- **Inspection:** Never touch the tape media with your fingers, as this can cause data loss and transfer dirt into the unit.
- **Labeling:** Do not apply labels outside the marked area. If a label is damaged but correctly placed, replace it rather than placing a new label over it. Always remove old labels before applying new ones.
- **Handling Drops:** If a tape is accidentally dropped, inspect it for damage such as a dislodged leader pin or damaged gear teeth.
- **Storage:** Pack tapes inside their cases when not in use, keep them upright, and avoid stacking.
- **Tape Integrity:** Do not open tapes. Removing screws and exposing the tape can cause damage and complicate reassembly.
- **Magnetic Fields:** Store tapes away from strong magnetic fields, such as those from x-rays, electric power boards, or transmission networks.
- **Transport:** Use suitable cases with individual compartments to prevent contamination from dust or debris. Avoid packing tapes near printers or copiers.
- **Acclimation:** Allow tapes to acclimate for 24 hours to the operating temperature and humidity before use.
- **Dryness:** Ensure all sides of the tape are dry before inserting it into the drive.
- **Exposure:** Keep tapes away from direct sunlight and humidity.
- **Ejection:** Always eject the media before turning off the drive.
- **Usage Rotation:** Use the PEPS (First Expired, First Served) or FIFO (First In, First Out) method to balance tape usage and minimize wear.



LT ZERO is a leading provider of comprehensive data management solutions, specializing in data backup, archival, and restoration solutions. Leveraging on cutting-edge technology and strategic collaboration with BDT, a leader in manufacturing of Tape Libraries, LT ZERO ensures robust and reliable data protection for businesses of all sizes.