

November 2001

Technical Bulletin

High-Capacity Half-Inch Tape Cartridge Care and Handling

Includes Imation 3590, 3590E, 9840, 9940, Digital Linear Tape, and Ultrium Cartridge Families

This bulletin describes the care and handling recommendations for all Imation half-inch, high capacity tape cartridges.

Every organization today faces the common challenge of secure data management. As the amount of data generated and stored during daily operations increases exponentially, successful data management emerges as the key to continued growth. It is for this reason that protecting valuable data is of the highest priority.

New half-inch tape technologies offer many advantages over previous technologies such as significantly increased capacity and improved overall system reliability. The compressed capacity of a single cartridge can approach 300GB, which is almost 500 times the compressed capacity of a 3480 cartridge. With today's growing capacity and performance demands, data center managers must emphasize the care and handling of media to help prevent loss of valuable data, time, and money. Continuing emphasis on cartridge handling, transportation, storage, and environment will not only protect valuable data written on cartridges, but also ensure that cartridges meet or exceed expected lifetimes.

Handling of Cartridges

All tape cartridges require the same basic care and handling. High capacity cartridges are more susceptible to damage due to increased linear density, increased track density, reduced substrate thickness, and the positioning of the data and servo tracks closer to the tape edges.

Below are some basic rules for handling cartridges:

- no more than six cartridges should be stacked or carried at a time to minimize the risk of dropping the stack;
- cartridges which are dirty or damaged should not be placed in a drive;
- finger grips should be utilized, if present, for the most effective method of lifting a single cartridge;
- leader blocks should not be removed and doors should not be opened to prevent tape damage;
- tape surfaces should never be touched since residue from a fingerprint can create greater head-to-tape separation and result in loss of signal (data).

Dropped Cartridges

If a high density half-inch tape cartridge is dropped, there is a strong possibility that the media inside the cartridge has been damaged, even if there is no visible evidence of damage on the outside of the cartridge. Tape edge damage or misalignment of internal components, such as the hub or tape pack may occur. This damage may not present itself initially, but may develop over time. For this reason, it is recommended that for any dropped cartridge, the data on that cartridge should be copied to another cartridge, and the dropped cartridge be retired. With large amounts of compressed data per cartridge, the importance of proper handling of cartridges cannot be overstated.

If dropping of cartridges is frequent, or even periodic, a formal training program should be implemented within the tape library to reinforce care and handling procedures. As a result of customer requests, Imation has developed an extensive training seminar to meet the care and handling needs of customers. For more information, contact your local Imation sales representative.

Transportation of Cartridges

Proper packaging of cartridges is imperative to guarantee the life of the cartridge, and the integrity of the data contained on it. Cartridges shipped with inadequate packaging could be damaged, which may result in data loss or reduced cartridge life.

Cartridges are shipped from the manufacturing plant in packaging specific to the tape technology being shipped. This packaging has been tested under extreme conditions to assure that the product will reach the customer without any compromise in quality. Customers should not accept any shipment of new cartridges that has not been delivered in the original, product-specific Imation packaging.

There are many occasions that require a cartridge or cartridges be shipped offsite. In these situations it is imperative that the packaging that is used to ship the cartridges is strong enough to withstand shipping damage, does not allow for cartridges to hit or rub against each other, minimizes the internal forces within the package, does not contaminate the cartridges, and can be used for repeated shipments without degradation of the packaging materials.

To ship a single cartridge, the cartridge should be enclosed in a plastic bag that is approved for use with data tape cartridges. Listed below is a resource for plastic bags that are suitable for this application using Part Number 9114487 (5-1/4"x17" x 4-1/2" Gusset 3 mil Polybag):

Unisource Tucson Office Supply System
3961 E. Speedway Suite 406
Tucson, Arizona 85712
Telephone: 520-322-5097

Unisource Worldwide Customer Service Center
20 Centerpointe Drive, Suite 130
La Palma, CA 90623
Telephone: 800-363-0861

The cartridge should then be placed in a shipping carton which meets the following requirements: 200 lbs burst, 32 lbs/in edge crush, 65 lbs gross weight. Prior to putting the cartridge in the box, the bottom of the box should be lined with several layers of bubble wrap; after inserting the cartridge in the shipper, another couple of layers of bubble wrap should be placed on top of the cartridge prior to sealing the box. Bubble wrap layers should be sufficient enough such that the cartridge cannot move around in the box.

If shipping more than one cartridge in the same container, a package must be used which will allow for all cartridges to be shipped safely, without impacting the quality of any of the cartridges surrounding it.

In addition to shipping cartridges in an appropriate multiple cartridge container, it is recommended that this container be placed in an overpack box to further reduce the potential of damage due to shipping. Multiple cartridge containers and overpack boxes which have been approved for various tape technologies can be purchased from the following supplier:

Perm-A-Store
105 S. Broadway, Suite 640
Wichita, KS 67202-4275
1-800-366-7535
1-316-264-4144
www.turtlecase.com

Perm-A-Store is not related to Imation, and Imation provides the reference to Perm-A-Store without warranty or indemnification of any kind by Imation.

If an overpack box is not readily available for the multiple cartridge container required, a cardboard box which meets the requirements of 200 lbs burst, 32 lbs/in edge crush, and 65 lbs gross weight in the appropriate size can be substituted (note: the original Imation shipper box meets this specification). Appropriate precautions to minimize shock and debris should be taken at all times.

In situations where disaster recovery or offsite storage services are contracted by a vendor, the requirements for containers used to transport cartridges are the same as those mentioned above:

- containers must be strong enough to withstand shipping damage,
- containers must be constructed so that cartridges are either isolated from each other, or are not free to move or rub against each other,
- containers must be built in such a way that internal forces within the package are minimized,
- containers must not contaminate cartridges in any way,
- containers must be able to be used for repeated shipments without degradation.

It is recommended that periodic inspections be done of multiple cartridge containers after repeated shipments to assure that all of the requirements mentioned above are met. During shipping there are three basic potential hazards which can lead to loss of data in the cartridge, or reduction in archival life of the cartridge. Those hazards are impact loads and vibration, extremes of temperature and humidity, and stray magnetic fields. The following recommendations should minimize damage to tape cartridges during transportation:

- avoid mechanical loads that would distort the cartridge shape;
- avoid dropping the packaged cartridge(s) more than 1 meter;
- utilize specified packaging per recommendations above;
- orient cartridges inside the final box such that their tape-reel axes are horizontal;
- mark the final box to indicate correct orientation;
- avoid extreme changes in temperature and humidity whenever possible - refer to recommended temperature conditions for unrecorded and recorded cartridges below;
- position cartridges so that there is a nominal spacing of 80 mm (3.15 in) between cartridge surface and the outer surface of the shipping container to avoid the corruption of data due to stray magnetic fields.

Below are the recommended conditions for transportation of cartridges:

Unrecorded Cartridge

- -23°C to 49°C (-10°F to 120°F)
- 5% to 80% relative humidity
- 26°C (78°F) maximum wet bulb

Recorded Cartridge

- 5°C to 32°C (40°F to 90°F)
- 5% to 80% relative humidity
- 26°C (78°F) maximum wet bulb

Operating Environment

To maximize tape life, tape cartridges should be kept in an atmosphere free of contaminating dust particles and corrosive gases or chemicals. Cartridges should always be acclimated to the operating environment prior to mounting the cartridge on the drive. Imation recommends a minimum of 24 hours of acclimation time to make sure the cartridge is at the same humidity and temperature as the drive for newly received tapes. The following range of operating conditions are considered acceptable:

- 16°C to 32°C (60°F to 90°F) dry bulb
- 20% to 80% relative humidity
- 26°C (78°F) maximum wet bulb

It is recommended to target the midpoint of these ranges, and to avoid the extreme conditions for extended periods of time. Note that localized temperatures in excess of 48°C (120°F) may cause tape damage.

Storage of Cartridges

The best storage container for the cartridges, until opened, is the Imation shipping container. The shrink wrap or plastic bag prevent dirt from accumulating on the cartridges. Cartridges can be stored within the following temperature and humidity ranges:

- 5°C to 32°C (40°F to 90°F) dry bulb
- 5% to 80% relative humidity
- 26°C (80°F) maximum wet bulb



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1 888 704 7100 fax
<http://www.imation.com>
info@imation.com

It is recommended that cartridges not be stored at temperature or humidity extremes for longer than four weeks.

Optimal long term archival storage conditions (i.e., more than four weeks) are as follows:

- 15°C to 25°C (59°F to 77°F) dry bulb
- 30% to 40% relative humidity
- 26°C (78°F) maximum wet bulb

Bulk Erasure

Imation 3590, 3590E, 9840, 9940, and Ultrium cartridges all contain factory pre-recorded servo tracks, and therefore must not be bulk erased. Check with specific hardware manufacturers for their procedure relative to data security erase.

No permanent magnet should be placed closer than 3 inches (76 mm) to a recorded surface at any time.

Situations Requiring No Special Requirements

Below is a list of conditions requiring no special precautions:

- airport metal detectors (detector field intensity 1.20e to 3980e)
- x-rays

- radar systems
- high voltages (<15,000 V)
- nuclear radiation
- light and laser beams (unless associated with intense heat or physical damage to the media)
- high pressure (other than avoiding permanent physical distortion to the media)

Summary

In summary, the objective of this white paper is to increase your awareness and understanding of the enhanced requirements for handling, transportation, and storage of high density tapes over their lower capacity predecessors. Implementation of the specifications, procedures, and practices outlined above are relatively low cost and straight-forward as compared to the cost and impact of data loss or reduced cartridge life.

Successful management of the data on high density half-inch tape cartridges begins with a solid program which includes compliance to the key considerations outlined in this paper. Once implemented, a continuing emphasis on these recommendations within the data center will further ensure data integrity and extend cartridge life.

References:

IBM Magstar 3590 Tape Subsystem Operator Guide, GA32-0330

ANSI NCITS 315-1998: Magnetic Tape and Cartridge for Information Interchange - Unrecorded, 128-track, Parallel Serpentine, 12.65 mm (1/2 in), 2550 ftpmm (64 770 ftpi),

www.NCITS.org

www.storagetek.com/products/tape/9840cart

www.storage.ibm.com/media/products.html#3590