IBM TotalStorage UltraScalable Tape Library 3584

Planning and Operator Guide

GA32-0408-05

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GA32-0408-05

Note!

Before using this guide and the product it supports, read the information in “Safety and Environmental Notices” on page xv and Appendix G, “Notices”, on page 297.

Sixth Edition (July 2003)

This edition applies to the *IBM TotalStorage UltraScalable Tape Library 3584 Planning and Operator Guide* and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces GA32-0408-04.

Read This First

This is the sixth edition of the *IBM TotalStorage UltraScalable Tape Library 3584 Planning and Operator Guide* (July 2003).

What's New In This Edition (July 2003)

Revision bars (|), like the one to the left of this line, appear next to all of the information that has been added or changed since the previous edition. The most significant changes include:

- Support for up to 16 frames, 192 drives, and 6881 cartridges, with four lengths of new-style track cables
- Library capacity of up to 1376 TB (2752 TB at 2:1 compression)
- Data path failover, control path failover, and load balancing
- Simultaneous active web users
- Multiple web login IDs and passwords
- Insert Notification feature
- Dual ac power

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Send us your comments by e-mail to *starpubs@us.ibm.com* or use the Readers' Comments form at the back of this publication. Be sure to include the following:

- Exact publication title
- Form number (for example, GA32-1234-02), or part number and EC level (located on the back cover)
- Page numbers to which you are referring

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Safety and Environmental Notices

When using this product, observe the danger, caution, and attention notices that are contained in this guide. The notices are accompanied by symbols that represent the severity of the safety condition.

Most danger or caution notices contain a reference number (RSFTDxxx or RSFTCxxx). Use the reference number to check the translation in the *IBM Externally Attached Devices Safety Information*, SA26-2004.

The sections that follow define each type of safety notice and give examples.

Danger Notice

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people. A lightning bolt symbol always accompanies a danger notice to represent a dangerous electrical condition. A sample danger notice follows:

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. *(RSFTD201)*

Caution Notice

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by one of several symbols:

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
 Class II	A hazardous condition due to the use of a laser in the product. Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth).
	A hazardous condition due to mechanical movement in or around the product.

If the symbol is...	It means....
	A hazardous condition due to the weight of the unit. Weight symbols are accompanied by an approximation of the product's weight.

Sample caution notices follow:

CAUTION:
This product contains a lithium battery. To avoid possible explosion, do not burn, exchange, or charge the battery. Discard the controller card as instructed by local regulations for lithium batteries. *(RSFTC232)*

CAUTION:
Ensure that all rack-mounted units are fastened in the rack frame. Do not extend or exchange any rack-mounted units when the stabilizer is not installed. *(RSFTC222)*

CAUTION:
This product complies with the performance standards set by the U.S. Food and Drug Administration for a Class II and IEC825 Laser Product. Avoid prolonged staring into the laser beam.

CAUTION:
The weight of this part or unit is between 18 and 32 kilograms (39.7 and 70.5 pounds). It takes two persons to safely lift this part or unit. *(RSFTC204)*

CAUTION:
This assembly contains mechanical moving parts. Use care when servicing this assembly.

Attention Notice

An attention notice indicates the possibility of damage to a program, device, or system, or to data. An exclamation point symbol may accompany an attention notice, but is not required. Sample attention notices follow:

Attention: If you use a power screwdriver to perform this procedure it could destroy the tape.

Attention: Do not operate the UltraScalable Tape Library in a poor air-quality environment.

Possible Safety Hazards

Possible safety hazards to the operation of this product are:

Electrical An electrically charged frame can cause serious electrical shock.

Mechanical Hazards, such as a safety cover missing, are potentially harmful to people.

Chemical Do not use solvents, cleaners, or other chemicals not approved for use on this product.

Repair any of the preceding problems before you use the UltraScalable Tape Library.

Laser Safety and Compliance

Before using the IBM TotalStorage UltraScalable Tape Library 3584, review the following laser safety information.

Class II Laser Product

The UltraScalable Tape Library is a Class II laser product. It is important for you to be aware of the laser caution label. See Figure 1 for an example of the label.

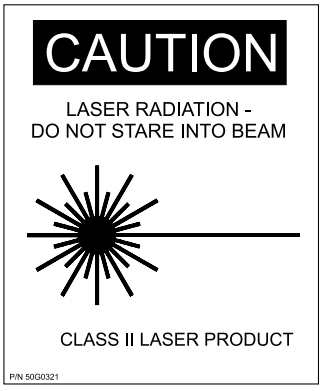

Figure 1. Laser safety caution label

This product complies with the performance standards set by the U.S. Food and Drug Administration for a Class II Laser product. This product belongs to a class of laser products that requires precautions be taken to avoid prolonged viewing of the

laser beam. Under normal working conditions, you must not come in direct contact with the laser beam. This classification was accomplished by providing the necessary protective housings and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class II limits. These products have been reviewed by external safety agencies and have obtained approvals to the latest standards as they apply to this product type.

Class I Laser Product

The UltraScalable Tape Library contains a laser assembly that complies with the performance standards set by the U.S. Food and Drug Administration for a Class I laser product. Class I laser products do not emit hazardous laser radiation. Protective housing and scanning safeguards ensure that laser radiation is inaccessible during operation or is within Class I limits. External safety agencies have reviewed the library and have obtained approvals to the latest standards as they apply.

End of Life (EOL) Plan

This box is a purchased unit. Therefore, it is the sole responsibility of the purchaser to dispose of it in accordance with local laws and regulations at the time of disposal.

This unit contains recyclable materials. The materials should be recycled where facilities are available and according to local regulations. In some areas, IBM may provide a product take-back program that ensures proper handling of the product. Contact your IBM representative for more information.

Preface

This guide contains information about how to plan for and operate the IBM TotalStorage UltraScalable Tape Library 3584. It includes the following chapters:

Chapter 1, “Introduction”, on page 1 provides an overview of the UltraScalable Tape Library, describes how it can process both Linear Tape-Open (LTO) Ultrium Tape Cartridges and DLTtape IV Tape Cartridges, summarizes its primary components, outlines performance considerations, addresses its Multi-Path architecture capabilities, describes methods for cleaning its tape drives, and describes the method for determining supported servers and operating systems.

Chapter 2, “Physical Planning Specifications”, on page 31 lists dimensions of the UltraScalable Tape Library. It describes clearance requirements, sets forth fire-suppression provisions, and defines specifications for the library and the media. In addition, the requirements for the power cord, power plug, and power receptacle are addressed.

Chapter 3, “Main Components”, on page 43 describes the primary parts of the UltraScalable Tape Library, including the frames, storage slots, tape drives, control ports, door features, and operator panel. It describes how drives and media may be mixed, and explains the compatibility of drives and media in frames, physical libraries, and logical libraries.

Chapter 4, “Operating Procedures”, on page 59 includes a table that lists the operating procedures (and their page locations) for the UltraScalable Tape Library. The procedures include how to power the library on or off, insert or remove cartridges, clean a drive, change a configuration, determine the status of components, perform an inventory, move a cartridge, or configure logical libraries. Instructions are given for operating the library by using its operator panel or IBM TotalStorage UltraScalable Tape Library Specialist web interface.

Chapter 5, “Using Ultrium Media”, on page 197 describes the data and cleaning cartridges to use in Ultrium Tape Drives. It defines the information that appears on a bar code label, gives requirements for a bar code label, tells how to set the write-protect switch on a tape cartridge, provides tips about storing, shipping, and handling cartridges, and offers information about where to order cartridges and supplies.

Chapter 6, “Using DLT Media”, on page 219 describes the data and cleaning cartridge to use in the Quantum DLT 8000 Tape System. It defines the information that appears on a bar code, gives requirements for a bar code label, tells how to set the write-protect switch on a tape cartridge, provides tips on storing, shipping, and handling cartridges, tells how to clean a tape drive, describes how to inspect a cartridge leader, and offers information about where to order DLT IV Tape Cartridges.

Chapter 7, “Using the Fibre Channel Interface”, on page 233 describes the requirements of the Fibre Channel interface, lists the types of topologies that the UltraScalable Tape Library supports, discusses the address scheme for the Fibre Channel tape drives, discusses the role of World Wide Names, and provides information about connectors and adapters.

Chapter 8, “Using the SCSI Interface”, on page 241 describes the requirements of the Small Computer Systems Interface (SCSI), and provides information about SCSI cables, connectors, interposers, and adapters.

Chapter 9, “Problem Determination”, on page 247 lists symptoms of possible problems with the UltraScalable Tape Library and recommends actions to take.

Appendix A, “Frame Capacity”, on page 255 provides tables that show the quantity of storage slots that are available in library frames, depending on whether the Capacity Expansion Feature is installed, the upper and lower I/O stations are used, and a specified quantity of drives are installed.

Appendix B, “Technical Components”, on page 257 describes several key components located within the UltraScalable Tape Library. Included are the rail assembly, cartridge accessor, dual-gripper transport mechanism, accessor controller, operator panel controller, frame control assembly, Medium Changer card pack, drives, and power supplies.

Appendix C, “TapeAlert Flags”, on page 265 lists TapeAlert messages that are supported by the Ultrium Tape Drives, DLT 8000 Tape System, and UltraScalable Tape Library. The messages may aid during problem determination.

Appendix D, “Locations and Addresses of SCSI Elements”, on page 271 shows the physical locations of storage slots, I/O slots, and drives in the Model L32 without the Capacity Expansion Feature, the Model L32 with the Capacity Expansion Feature, the Model D32, and the Model D42. It then gives the rules for mapping these physical locations to their corresponding SCSI element addresses.

Appendix E, “Feature Codes”, on page 283 gives the codes that you need when ordering features for the UltraScalable Tape Library.

Appendix F, “Statement of Limited Warranty”, on page 293 contains the warranty statement for the UltraScalable Tape Library.

Appendix G, “Notices”, on page 297 tells where and how to send your comments about this book. It also gives information about the electronic emission regulations that pertain to the UltraScalable Tape Library in the United States and other countries or regions.

Related Publications

Refer to the following publications for additional information about the UltraScalable Tape Library. To ensure that you have the latest publications, visit the web at:

`http://www.ibm.com/storage/lto`

IBM TotalStorage UltraScalable Tape Library 3584 Publications

- *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information*, SA37-0426
- *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*, GA32-0454
- *The IBM LTO Ultrium Tape Libraries Guide*, SG24-5946

IBM @server iSeries and AS/400 Publications

- *Basic System Operation, Administration and Problem Handling*, SC41-5206
- *OS/400 Backup and Recovery*, SC41-5304
- *AS/400 Physical Planning Reference*, SA41-5109
- *System API Reference*, SC41-5801 (in softcopy only)
- *Automated Tape Library Planning & Management*, SC41-5309
- *Backup Recovery and Media Services*, SC41-5345
- *Hierarchical Storage Management*, SC41-5351
- *A Practical Approach to Managing Backup Recovery and Media Services*, SG24-4840 (in softcopy only)
- *The System Administrator's Companion to AS/400 Availability and Recovery*, SG24-2161 (in softcopy only)

IBM @server pSeries and RS/6000 Publications

- *Site & Hardware Planning Information*, SA38-0508
- *RISC System/6000 Adapters, Devices, and Cable Information for Multiple Bus Systems*, SA38-0516
- *Adapters, Devices, and Cable Information for Micro Channel Bus Systems*, SA23-2764

Other Publications and Sources

- For a list of compatible software, operating systems, and servers, visit the web at `http://www.ibm.com/storage/lto`. Select `LTO support`, then `Interoperability matrix and software (ISVs)`. Under `Supported servers and operating systems` or `Supported storage management software`, select `IBM TotalStorage UltraScalable Tape Library 3584`.
- *IBM TotalStorage LTO Ultrium 2 Tape Drive Models T400 and T400F Setup, Operator, and Service Guide*, GA32-0455
- *StorageSmart by IBM Ultrium Tape Drive Models T200 and T200F Setup, Operator, and Service Guide*, GA32-0435
- *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference*, GA32-0450
- *IBM Externally Attached Devices Safety Information*, SA26-2004
- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430
- *IBM Ultrium Device Drivers Programming Reference*, GC35-0483
- *Quantum DLT 8000 Tape System Product Manual*
- *IBM General Information Installation Manual-Physical Planning*, GC22-7072

Authorized Suppliers of Bar Code Labels

In America	In Europe and Asia
EDP/Colorflex 697 South Pierce Street Louisville, CO 80027 U. S. A. Telephone: 800-522-3528 http://www.colorflex.com/Ai/Home.asp	EDP Europe, Ltd. 43 Redhills Road South Woodham Ferrers Chelmsford, Essex CM3 5UL U. K. Telephone: 44 (0) 1245-322380 http://www.edpeurope.com/media_labelling.htm
Dataware 7570 Renwick Houston, TX 77081 U. S. A. Telephone: 800-426-4844 http://www.datawarelabels.com/	Dataware Labels Europe Heubergstrasse 9 D-83052 Bruckmuhl-Gotting Germany Telephone: 49 806-29455 http://www.datawarelabels.com/
NetC P. O. Box 320784 Fairfield, CT 06432 U. S. A. Telephone: 203-372-6382 http://www.netcllc.com/	NetC Europe Ltd Town Farm Bungalow North Curry Taunton Somerset U. K. TA3 6LX Telephone: 44 (0) 1823 491439 http://www.netclabels.co.uk
	NetC Asia Pacific Pty Ltd Locked Bag 14 Kenthurst NSW Australia 2156 Telephone: 61 (0) 2 9654 8272 http://www.netclabels.com.au

Chapter 1. Introduction

The IBM® TotalStorage™ UltraScalable Tape Library 3584 is a stand-alone device that provides reliable, automated tape handling and storage for unattended mid-range systems and network servers in an Open Systems environment.
| Scalability, in terms of frames, tape drives, and tape cartridges for the UltraScalable
| Tape Library, has recently been enhanced to a maximum of 16 frames, 192 drives,
| and 6881 cartridges. This enhancement represents a library capacity of up to 1376
| TB (2752 TB at 2:1 compression).

| The library's Ultrium 2 Tape Drive technology features a native capacity of 200 GB
| (400 GB at 2:1 compression) with the IBM TotalStorage LTO Ultrium 200 GB Data
| Cartridge. It also features a native data rate of 35 MB/s (70 MB/s at 2:1
| compression). Ultrium 2 Tape Drives can read and write Ultrium 1 Tape Drive data
| cartridges, and Ultrium 2 Tape Drives and cartridges can reside in the same frame
| with Ultrium 1 Tape Drive drives and data cartridges.

| Figure 2 shows the 6-frame version of the IBM TotalStorage UltraScalable Tape
| Library 3584, which can now be expanded to 16 frames.

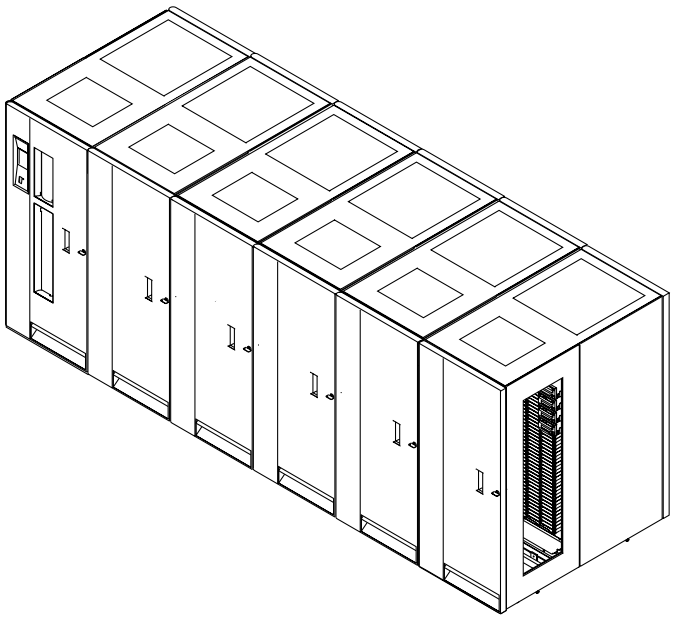

Figure 2. The IBM TotalStorage UltraScalable Tape Library 3584. The library can contain up to 16 frames.

Other enhancements to the UltraScalable Tape Library include:

- Data path failover, control path failover, and load balancing
- Simultaneous active web users
- Multiple web login IDs and passwords
- Insert Notification feature
- Dual ac power

The sections that follow describe these enhancements.

Data Path Failover, Control Path Failover, and Load Balancing

Command failures and timeouts are costly. You want your library to run smoothly and efficiently. To ensure continued processing, libraries that are equipped with Fibre Channel Ultrium 2 Tape Drives offer path failover and load balancing capabilities that enable the IBM Ultrium device driver to resend a command to an alternate path. The alternate path can include another host bus adapter (HBA), Storage Area Network (SAN), or library control path drive. The device driver initiates error recovery and continues the operation on the alternate path without interrupting the application. At this time, only AIX® hosts support these features.

Two types of path failover capabilities exist: *control path failover (CPF)* and *data path failover (DPF)*. *Control* refers to the command set that controls the library (the SCSI Medium Changer command set on LUN 1 of the tape drives). *Data* refers to the command set that carries the customer data to and from the tape drives (the SCSI-3 Stream Commands (SSC) device on LUN 0 of the tape drives). Path failover means the same thing in both: that is, where there is redundancy in the path from the application to the intended target (the library accessor or the drive mechanism, respectively), the device driver transparently fails over to another path in response to a break in the active path.

Both types of failover include host-side failover when configured with multiple HBA ports into a switch, but only CPF has target-side failover through the control paths that are enabled on more than one tape drive.

DPF includes load balancing of the HBAs because the channel is a data-intensive path (the control path carries very little data, so load balancing is not an issue). The dynamic load balancing support optimizes resources for devices that have physical connections to multiple HBAs in the same machine. When an application opens a device that has multiple HBA paths configured, the device driver determines which path has the HBA with the lowest usage and assigns that path to the application. When another application opens a different device with multiple HBA paths, the device driver again determines the path with the lowest HBA usage and assigns that path to the second application. The device driver will update the usage on the HBA assigned to the application when the device is closed. Dynamic load balancing will use all HBAs whenever possible and balance the load between them to optimize the resources in the machine.

Both DPF and CPF require the use of the IBM Ultrium device driver, and are supported exclusively with automation products that bear the IBM logo. CPF is a chargeable library feature for all forms of Ultrium drives; DPF is free with the IBM Ultrium device driver, but is limited to Fibre Channel Ultrium 2 Tape Drives. Table 1 on page 3 summarizes the differences between DPF, CPF, and load balancing.

Table 1. Differences between DPF and CPF

Characteristic	CPF	DPF	Load Balancing
Device type	SMC[1]	SSC[2]	SSC
LUN[3]	LUN 1	LUN 0	LUN 0
Host-side failover	Y[4]	Y	Y
Target-side failover	Y	N[5]	N
IBM device driver required	Y	Y	Y
License key required	Y	N	N
Ultrium 2 Tape Drives supported	Y	Y	Y
Ultrium 1 Tape Drives supported	Y	N	N
SCSI attachment supported	Y	N	N
Fibre Channel attachment supported	Y	Y	Y

Notes:

1. SMC = SCSI-3 Medium Changer Specification
2. SSC = SCSI-3 Stream Commands
3. LUN = logical unit number
4. Y = Yes
5. N = No

The control path failover feature can be enabled at the factory, or you may order it later and have your IBM Service Representative enable it. To order the feature, contact your IBM Sales Representative.

Note: The control path failover feature is activated by a license key that is entered by your service representative.

For more information about using these features, see the *IBM Ultrium Device Drivers Installation and User's Guide*.

Simultaneous Active Web Users

The library features a web interface called the IBM TotalStorage UltraScalable Tape Library Specialist. Each Ethernet-capable frame allows up to five simultaneous users of the web interface. In this way, the library enhances productivity by allowing multiple tasks to be performed concurrently. For more information about simultaneous active web users, see "Viewing Users with Active Sessions" on page 93.

Multiple Web Login IDs and Passwords

The library's IBM TotalStorage UltraScalable Tape Library Specialist can support up to nineteen additional unique web login accounts. Each account includes a:

- 15-character login ID
- Role (job description)
- 30-character comment area
- 15-character password

Password protection for the UltraScalable Specialist application must be turned on or off by an administrator. However, account users can change their own passwords.

Insert Notification

Insert Notification is an option by which the library monitors the I/O station for any new media that does not have a logical library assignment. This notification can be caused if you open the I/O station door and place a cartridge into an empty I/O slot, or if you open the I/O station door and move a cartridge from one I/O slot to another. If you enable Insert Notification, when new media is detected the operator panel displays a message that asks you to select a logical library. Any unassigned cartridges in the I/O station will be assigned to the logical library that you select (and all other logical libraries will not be able to access the cartridges). The library includes an option to defer any assignment and there is a time-out period when the deferral will automatically take effect.

Dual ac Power

A dual ac power feature, which supports 110 V ac or 220 V ac, is available for the UltraScalable Tape Library. It provides two independent line cords that may be connected to two independent branch power feed. Dual ac power enhances library availability by having an alternative power source in case of planned or unplanned power grid outages. The switch monitors the ac line voltage from the feed it is using and automatically switches to the alternate power feed if the incoming voltage is lost.

Structure of Library

The basic library is a single storage unit known as the base frame. The library's scalability allows you to increase capacity by adding up to fifteen additional storage units, called expansion frames. The additional expansion frames are supported by a common cartridge accessor that requires no pass-through mechanism. Each frame in the library may contain up to twelve Ultrium Tape Drives or DLT 8000 Tape Systems, but may not contain a mix of both (for information about drives, see "Tape Drives" on page 8).

A matrix of compatible drives and cartridges is available in "Mixing Media in Drives" on page 10. To view the compatibility of drive types in frames, see "Mixing Drive Types in Frames" on page 11. To view the compatibility of drive types within a logical library, see "Mixing Ultrium Drive Types Within a Logical Library" on page 12.

To suit your system capacity and performance needs, you can tailor the UltraScalable Tape Library to take advantage of the following features:

- Use of up to 192 Ultrium Tape Drives or 60 DLT 8000 Tape Systems
- Use of up to 6881 cartridge storage slots
- Native data capacity of up to 1376 TB (2752 TB at 2:1 compression) with IBM Ultrium 2 Tape Cartridges. Native data capacity of up to 688 TB (1376 TB) at 2:1 compression) with Ultrium 1 Tape Cartridges
- For the IBM Ultrium 2 Tape Drive, support of any combination of Fibre Channel, Low Voltage Differential (LVD) Ultra160 SCSI, and High Voltage Differential (HVD) Ultra SCSI interfaces
- For the IBM Ultrium 1 Tape Drive, support of any combination of Fibre Channel, LVD Ultra2 SCSI, and HVD Ultra SCSI interfaces

- For the DLT Tape System, support of the Fast/Wide LVD and HVD SCSI interfaces
- Multi-Path Architecture that enables a single library to be shared by multiple homogeneous or heterogeneous applications
- Support of any appropriate combination of frames that use Digital Linear Tape (DLT) or Linear Tape-Open (LTO) Ultrium media (up to a maximum total of six frames when using DLT media)

The UltraScalable Tape Library features three models of frames. The models vary, depending on the type of drives that they contain and whether the frame is a base or expansion frame:

Model L32
A base frame that uses Ultrium Tape Drives and IBM LTO Ultrium Tape Cartridges

Model D32
An expansion frame that uses Ultrium Tape Drives and IBM LTO Ultrium Tape Cartridges

Model D42
An expansion frame that uses DLT 8000 Tape Systems and DLTtape IV Tape Cartridges

Figure 3 shows examples of a base and an expansion frame.

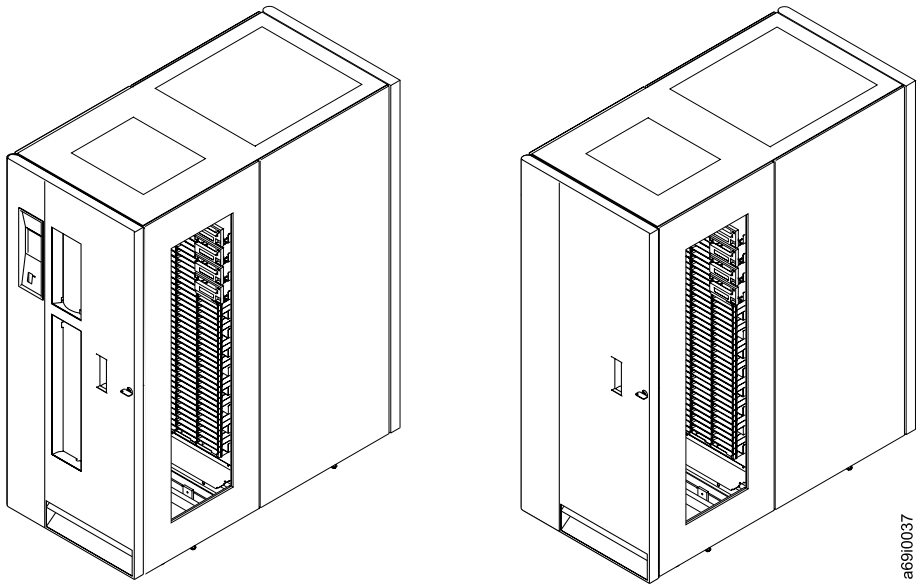

Figure 3. Frames in the IBM TotalStorage UltraScalable Tape Library 3584. Model L32 (the base frame) is on the left. Model D32 (the expansion frame) is on the right and attaches to the base frame. Models L32 and D32 house LTO Ultrium Tape Cartridges; Model D42 (not shown) houses DLTtape IV Tape Cartridges.

Library Components

The UltraScalable Tape Library consists of the major components shown in Figure 4 on page 7 (the figure depicts Model L32). For a more complete description of each component, see Chapter 3, “Main Components”, on page 43 or Appendix B, “Technical Components”, on page 257.

1 Library frames
The base frame (Model L32 for Ultrium Tape Drives) and the expansion frame (Model D32 for Ultrium Tape Drives or Model D42 for DLT Tape Systems). Each frame contains a rail system, cartridge storage slots, and up to 12 tape drives.

2 Rail system
The assembly on which the cartridge accessor moves through the library. The system includes the top and bottom rails.

3 Cartridge accessor
The assembly that moves tape cartridges between storage slots, tape drives, and the I/O stations.

4 Dual-gripper transport mechanism
A device that gets and puts tape cartridges from and to storage slots, tape drives, and the I/O stations.

5 Accessor controller
A circuit board that facilitates all accessor motion requests (such as calibrations, moves, and inventory updates).

6 Cartridge storage slots
Containers that are mounted in the UltraScalable Tape Library and used to store tape cartridges.

7 IBM LTO Ultrium Tape Drives or DLT Tape System
Mounted in the UltraScalable Tape Library, one or more units that read and write data that is stored on tape cartridges. IBM LTO Ultrium Tape Drives and DLT Tape Systems may not be mixed in the same frame. IBM Ultrium Tape Drives use LTO Ultrium Tape Cartridges; the DLT Tape System uses DLTtape IV Tape Cartridges.

8 Front door
The front door of any frame. When you order the Capacity Expansion Feature for the Model L32, the storage slots inside the front door become enabled and can increase the tape library’s capacity.

9 Door safety switch
A device in each frame that shuts down the motion power to the cartridge accessor whenever the front door is opened.

10 I/O stations
Up to two cartridge compartments on the front door of the UltraScalable Tape Library that allow you to insert or remove tape cartridges without the library performing a reinventory of the frame.

11 Operator panel and operator panel controller
Located on the front of the base frame, the operator panel is the set of indicators and controls that lets you perform operations and determine the status of the library. The panel consists of the library power switch, a power-on indicator, a touchscreen liquid crystal display (LCD), and the controller for the I/O stations. The operator panel controller is a circuit board that facilitates communication between the operator panel and the accessor controller.

12 Frame control assembly (FCA)
An assembly of components that facilitates RS-422 communication between the set of drives within the frame and the accessor controller and operator panel controller. The FCA also controls the distribution of ac power to frames and dc power to the library.

13 Patch panel
A panel that houses the cable connections for the drives that use Fibre Channel interfaces.

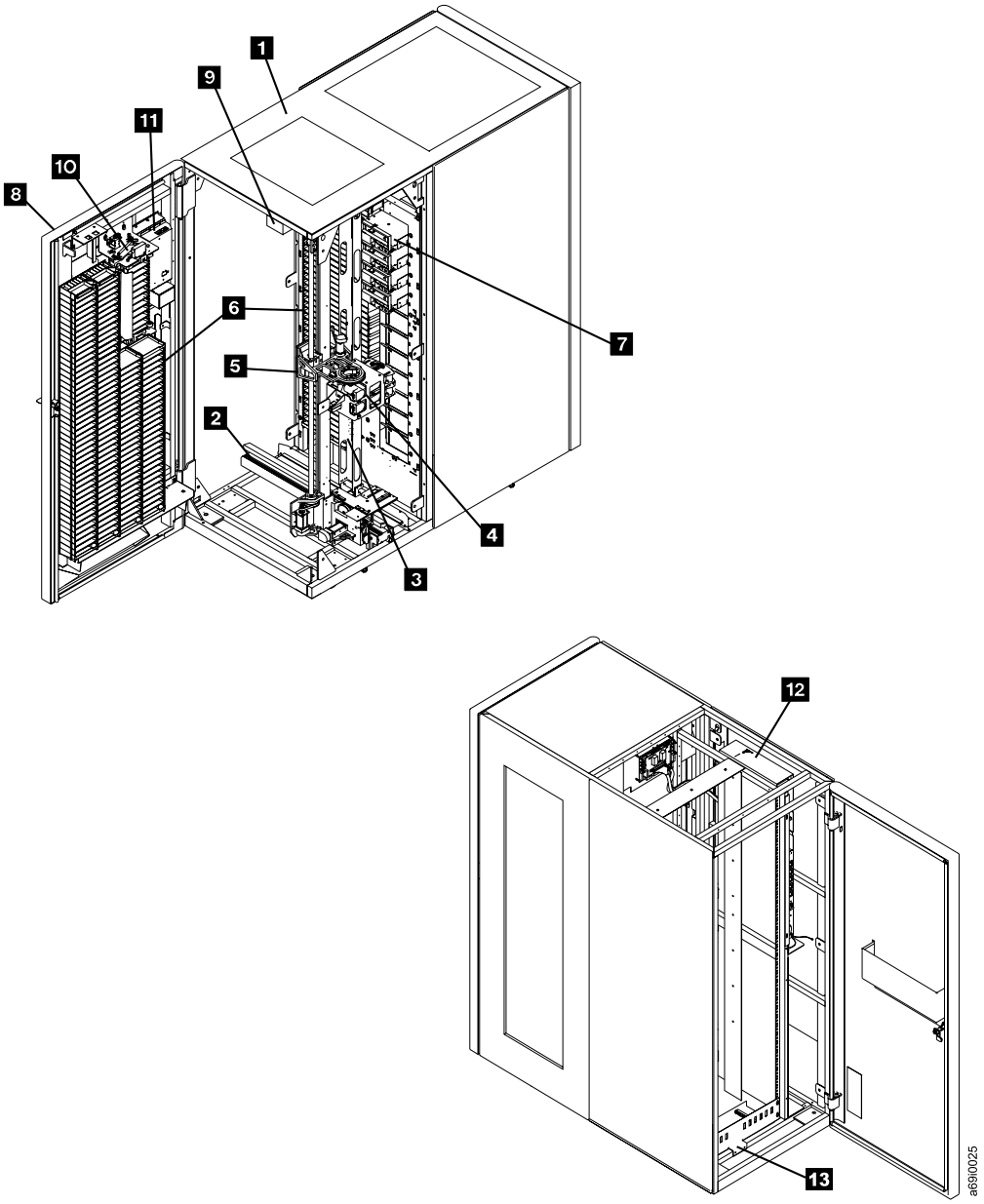

Figure 4. Components of the IBM TotalStorage UltraScalable Tape Library 3584. The front and rear of the Model L32 library are shown.

Tape Drives

The Ultrium Tape Drives and the DLT 8000 Tape System are high-performance, high-capacity data-storage units that can be installed in the UltraScalable Tape Library. Up to 12 Ultrium Tape Drives or DLT 8000 Tape Systems may be installed in each frame of the library.

The Ultrium 2 Tape Drive is compatible with the cartridges of its predecessor, the Ultrium 1 Tape Drive. When labeled according to proper IBM bar code label specifications (see “Bar Code Label” on page 200), the last character of a cartridge’s volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge. Cartridge compatibility for the Ultrium 2 Tape Drive is as follows:

- Reads and writes Ultrium 2 format on Ultrium 2 cartridges
- Reads and writes Ultrium 1 format on Ultrium 1 cartridges
- Does not write Ultrium 2 format on Ultrium 1 cartridges
- Does not write Ultrium 1 format on Ultrium 2 cartridges

The IBM Ultrium 2 Tape Drive reads tapes that have been written by non-IBM Ultrium drives. It also writes to tapes that can be read by non-IBM Ultrium drives.

For a matrix of compatible media and drives, see Table 2 on page 10. For a matrix that shows how to mix drive types in frames or within a logical library, see “Mixing Drive Types in Frames” on page 11 or “Mixing Ultrium Drive Types Within a Logical Library” on page 12.

To enhance library performance, the Ultrium 2 Tape Drive includes the following features:

- Speed matching
- Channel calibration
- Power management

The sections that follow describe each feature.

Speed Matching

The Ultrium 2 Tape Drive uses a technique called *speed matching* to dynamically adjust its native (uncompressed) data rate to the slower data rate of a server.

Channel Calibration

The Ultrium 2 Tape Drive channel calibration feature customizes each read/write data channel for optimum performance. The customization enables compensation for variations in the recording channel transfer function, media characteristics, and read/write head characteristics.

Power Management

The Ultrium 2 Tape Drive reduces drive power consumption during idle power periods.

Tape Cartridges

Frames that are installed with Ultrium Tape Drives use LTO Ultrium Tape Cartridges and frames that are installed with DLT 8000 Tape Systems use DLTtape IV Tape Cartridges. A frame cannot use both types of cartridges. However, in a library that uses mixed drive types, you may insert DLTtape IV Tape Cartridges into an 18-slot, lower I/O station of a Model L32 frame for transport (by the cartridge accessor) to a Model D42 frame.

The capacity for supported cartridges is:

- IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (native capacity of 200 GB; compressed capacity of 400 GB at 2:1 compression).
- IBM LTO Ultrium Data Cartridge (native capacity of 100 GB; compressed capacity of 200 GB at 2:1 compression)
- DLTtape IV Data Cartridge (native capacity of 40 GB; compressed capacity of 80 GB at 2:1 compression)

Certain restrictions apply to the use of tape cartridges with drives. For an overview of the compatibility between supported cartridges and drives, see Table 2 on page 10.

Cleaning cartridges are identified by a VOLSER that begins with a prefix of `CLN`.

For additional information about the tape cartridges that can be used by the library, see Chapter 5, “Using Ultrium Media”, on page 197 and Chapter 6, “Using DLT Media”, on page 219.

Mixing Media in Drives

Not all cartridges that are supported by the UltraScalable Tape Library are compatible with all drives. Table 2 gives a matrix of compatible cartridges and drives.

Note: When labeled according to proper IBM bar code label specifications (see "Bar Code Label" on page 200), the last character of a cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge. Cartridge compatibility for the Ultrium 2 Tape Drive is as follows:

Table 2. Compatible cartridges and drives

Cartridges	Drives (see Notes 1 and 2)		
	Ultrium 2 Tape Drive	**Ultrium 1 Tape Drive**	**DLT Tape Drive**
Ultrium 2 Data Cartridge (xxxxxxL2)	Y	N (see Note 3)	N
Ultrium 1 Data Cartridge (xxxxxxL1)	Y	Y	N
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal, CLNUxxL1)	Y	Y (see Note 4)	N
LTO Ultrium Cleaning Cartridge (IBM only, CLNIxxL1)	Y	Y	N
DLT Data Cartridge	N	N	Y
DLT Cleaning Cartridge	N	N	Y

Notes:

1. Y = supported.
2. N = unsupported.
3. The library rejects any command to move an Ultrium 2 data cartridge to an Ultrium 1 drive, and returns a sense key of 5 and an additional sense code/additional sense code qualifier of 30/00.
4. Requires drive firmware level 25D4 or higher.

Mixing Drive Types in Frames

The UltraScalable Tape Library lets you combine Models L32, D32, and D42. You can order a Model L32 frame (or a feature for an existing frame) such that the device that moves the cartridges (the grippers) can handle both LTO and DLT media.

Not all drives and cartridges are compatible in all frames. Table 3 gives a matrix for mixing drive types and frames.

To learn more, see “Mixing Media in Drives” on page 10 and “Mixing Ultrium Drive Types Within a Logical Library” on page 12.

Table 3. Mixing drives types in frames

Drive Types	Model L32	Model D32	Model D42
Ultrium 2	Y (see Note 1)	Y	N (see Note 2)
Ultrium 1	Y	Y	N
DLT	N	N	Y

Notes:

1. Y = supported.
2. N = unsupported.

Mixing Ultrium Drive Types Within a Logical Library

The UltraScalable Tape Library supports mixed Ultrium drive types in the same logical library. Some ISVs support mixed drive types within logical libraries; others do not. Some ISVs that support mixed drive types do so with restrictions. For details, contact your ISV.

For situations where the ISV support does not exist or does not meet your requirements, the UltraScalable Tape Library provides another option to protect your investment by partitioning the tape drives into separate logical libraries. You can customize the partition to any number of slots by using menus or special bar code labels.

Figure 5 shows examples of methods for mixing Ultrium drive types.

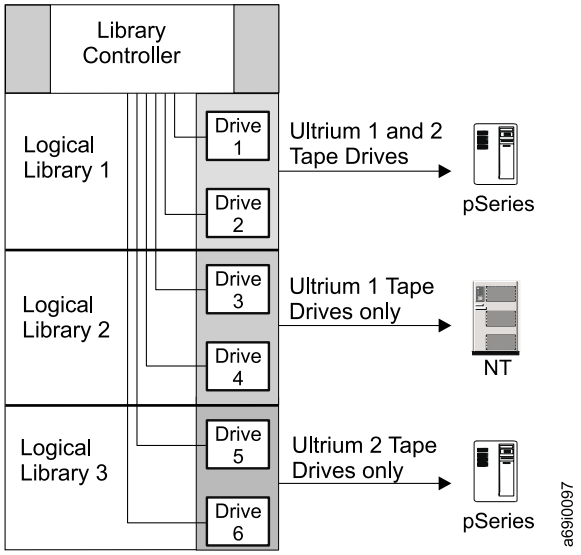

Figure 5. Examples of methods for mixing Ultrium drive types

Multi-Path Architecture

The UltraScalable Tape Library features the Storage Area Network (SAN)-ready Multi-Path Architecture, which allows homogeneous or heterogeneous open systems applications to share the library's robotics without middleware or a dedicated server (host) acting as a library manager. The SAN-ready Multi-Path Architecture makes sharing possible by letting you partition the library's storage slots and tape drives into logical libraries. Servers can then run separate applications for each logical library. This partitioning capability extends the potential centralization of storage that the SAN enables. Partitioning also provides investment protection for Ultrium 1 Tape Drives if your application does not support the mixing of Ultrium 1 and Ultrium 2 Tape Drives and media in the same logical library. The Multi-Path Architecture is compliant with the following attachment interfaces:

- Small Computer Systems Interface (SCSI)
- Fibre Channel

Whether partitioned or not, the UltraScalable Tape Library is certified for SAN solutions (such as LAN-free backup).

The Multi-Path Architecture also lets you configure additional control paths for any one logical library. A control path is a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library. Additional control paths reduce the possibility that failure in one control path will cause the entire library to be unavailable. Use of the control path failover feature further reduces that possibility (see "Using Multiple Control Paths for Control Path Failover" on page 19).

For details about configuring the library to share robotics, see "Library Sharing" on page 14.

Library Sharing

The UltraScalable Tape Library's default configuration allows a single application to operate the library through a single control path. Often, however, it is advantageous to be able to share a single library between heterogeneous (dissimilar) or homogeneous (similar) applications. Some applications (and some servers) do not allow for sharing a library between systems. With the UltraScalable Tape Library, however, you can create configurations that enable the library to process commands from multiple heterogeneous applications (such as an IBM @server pSeries™ application and a Windows NT® application) and multiple homogeneous applications (for example, the same application run by several pSeries servers).

From the library's web interface or operator panel, you can perform the following actions:

- Configure the library so that is partitioned into separate logical libraries that independently communicate with separate applications through separate control paths. This configuration (see example **1** in Figure 6 on page 15 or Figure 7 on page 16) requires no special capabilities from the server or application. (For more information, see "Using Multiple Logical Libraries" on page 17.)
- Configure any single logical library (including the entire physical library) so that it is shared by two or more servers that are running the same application. Depending on the capabilities of the server and application, there are several ways to set up this type of configuration. Three typical ways include:
  - Configuring one server (host) to communicate with the library through a single control path; all other servers send requests to that server through a network (see example **2** in Figure 6 on page 15 or Figure 7 on page 16). This configuration is used by Tivoli® Storage Manager (TSM).
  - Configuring all of the servers to communicate with the library through a single, common control path (see example **3** in Figure 6 on page 15 or Figure 7 on page 16). This configuration is used in high-availability environments such as IBM's High Availability Clustered Microprocessing (HACMP) and Microsoft®'s Systems Management Server (SMS) and Clustered Server Environments. Multi-initiator configurations are only supported by certain adapters and ISVs. Check with your ISV.
  - Configuring a single logical library to communicate with multiple servers through multiple control paths. This configuration (see example **4** in Figure 6 on page 15) requires that you add control paths (see "Using Multiple Control Paths" on page 18). It is used by Backup Recovery and Media Services (BRMS).

    Note: The iSeries™ or AS/400® servers do not support DLT 8000 Tape Systems.

Your library configuration is not limited to the examples shown in Figure 6 on page 15 or Figure 7 on page 16. Many configurations are possible, and you can design them according to your business needs.

Example Configurations for a Library with Ultrium Tape Drives

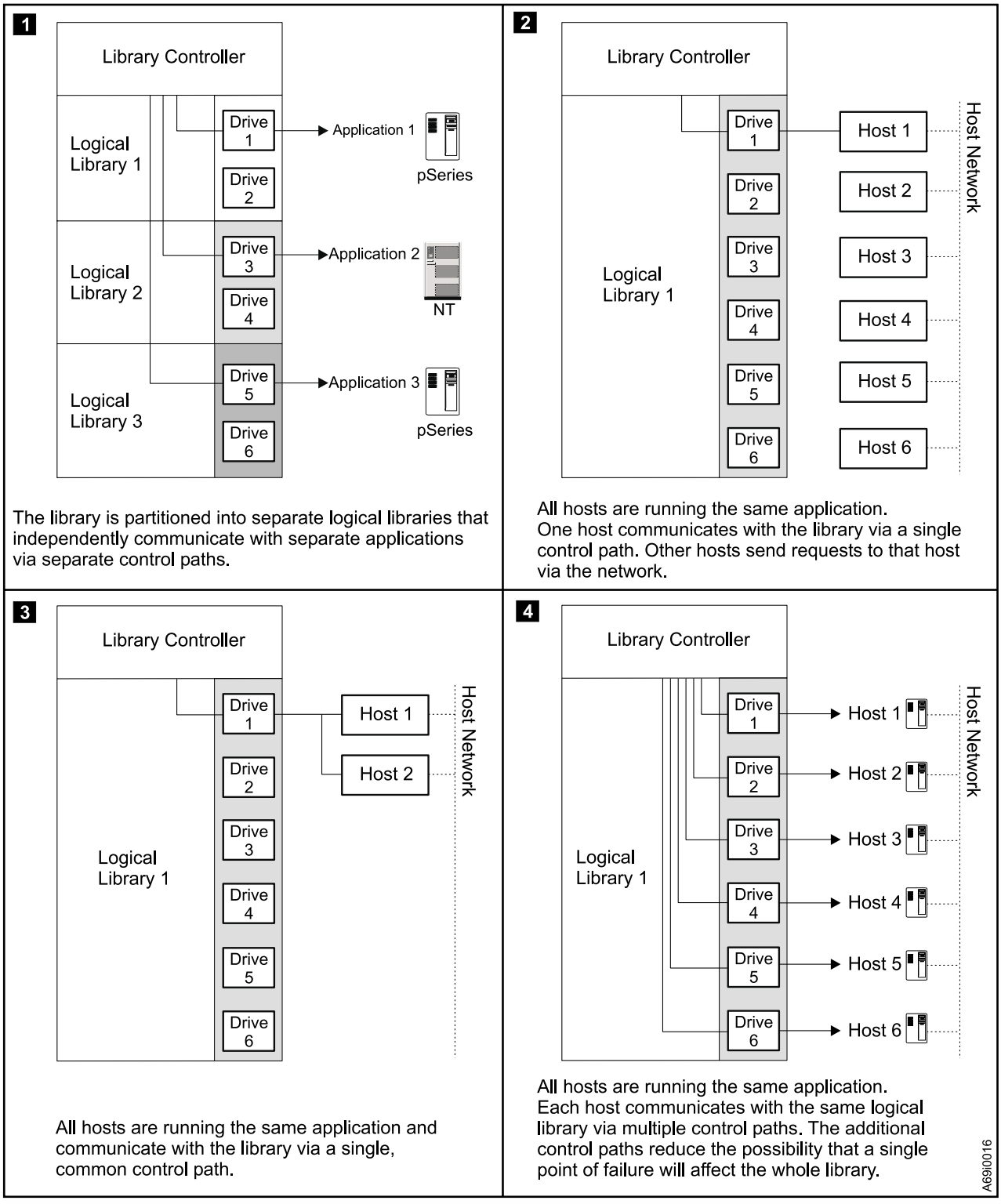

Figure 6. Examples of configurations for a IBM TotalStorage UltraScalable Tape Library 3584 that uses Ultrium Tape Drives. Lines from one or more drives to the library controller represent control paths.

Example Configurations for a Library with DLT 8000 Tape Systems

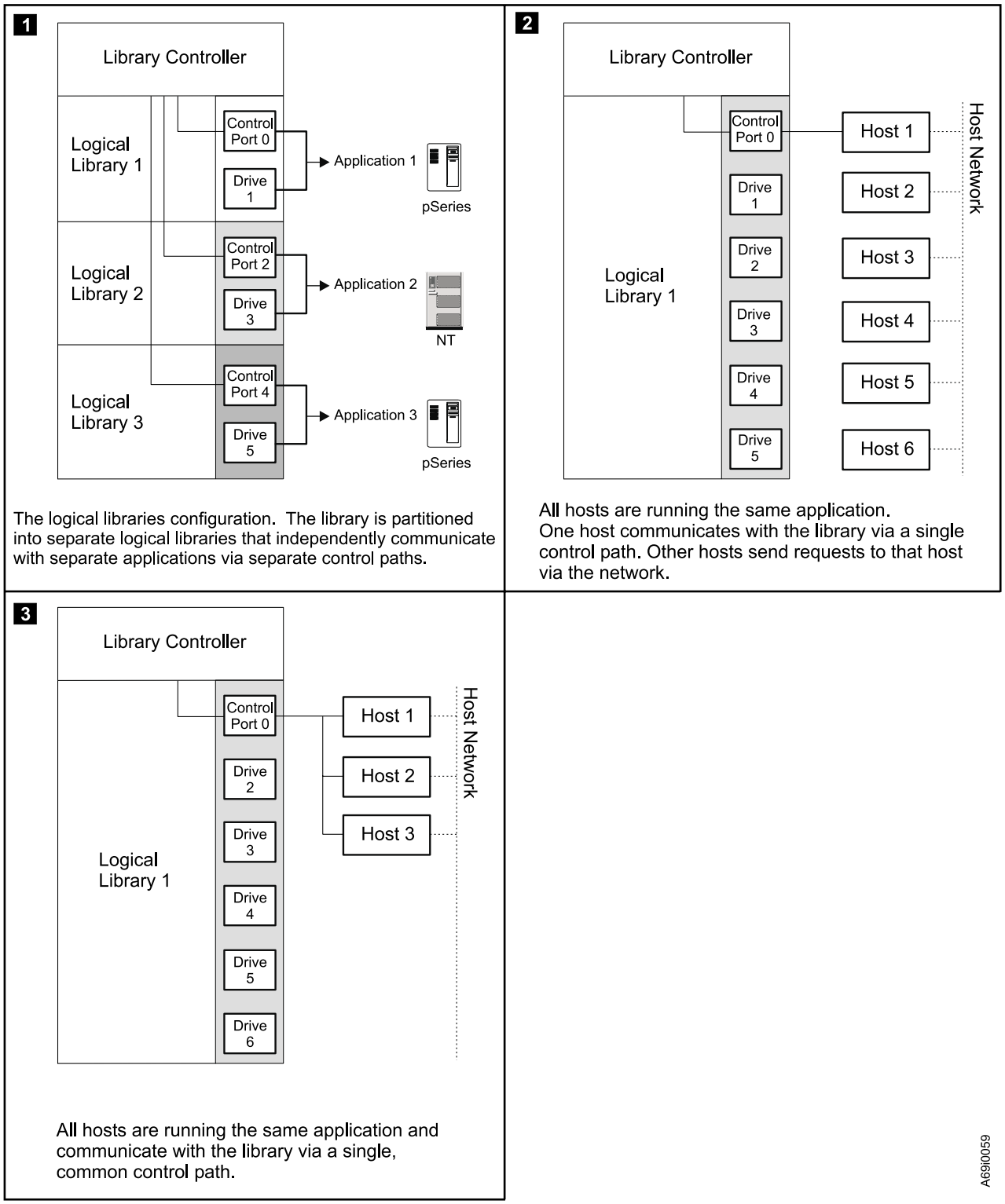

Figure 7. Examples of configurations for a IBM TotalStorage UltraScalable Tape Library 3584 that uses DLT 8000 Tape Systems. Lines from one or more drives to the library controller represent control paths.

Using Multiple Logical Libraries

To maximize your investment, you can use multiple logical libraries to share the physical library between applications or to support mixed drive types for any application. The sections that follow give guidelines for both processes.

You can create multiple logical libraries by partitioning the physical library's storage slots and tape drives into two or more logical libraries. Each logical library consists of:

- Tape drives
- Storage slots
- Input/output (I/O) slots
- Cartridge accessor

Each logical library has its own control path (a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library). For Ultrium frames, each logical library control path is available to servers through logical unit number 1 (LUN 1) of the first drive that is defined within that logical library. A logical unit number is a number used by a server to identify a drive. For DLT frames, each logical library control path is available to servers through LUN 0 of a dedicated control port.

A logical library cannot share another logical library's tape drives and storage slots. However, it does share the I/O slots and the cartridge accessor on a first-come, first-served basis. In addition, a logical library cannot include both LTO and DLT elements. That is, you must configure LTO and DLT elements (drives, storage slots, I/O slots, and grippers) into separate logical libraries.

Frames that use Ultrium Tape Drives can be partitioned into twelve logical libraries, and frames that use DLT 8000 Tape Systems can be partitioned into six logical libraries. You can partition multiple logical libraries by using one of two methods:

- Opening the door of the library and manually labeling the elements (storage slot columns and drives) that you want to include in each logical library (see "Configuring the Library by Using Labels" on page 123). This method enables you to view your partition at a glance whenever you open the front doors.
- Identifying the quantity of elements that you want to include in each logical library, then using the UltraScalable Specialist configuration wizard or the operator panel menus to create the logical libraries (see "Configuring the Library by Using Menus" on page 132). This method makes it unnecessary for you to manually label the elements, but you cannot view your partition whenever you open the front doors.

To create or change the configurations for your UltraScalable Tape Library, see "Configuring the Library without Partitions" on page 119 or "Configuring the Library with Partitions" on page 123.

When automatic cleaning is enabled, any appropriate cleaning cartridge may be used to clean a drive in any configured logical library, even if the cartridge resides in a different logical library. For additional details, see "Drive Cleaning" on page 24.

The following sections describe two uses for multiple logical libraries.

Using Multiple Logical Libraries for Library Sharing

Multiple logical libraries are an effective way for the UltraScalable Tape Library to simultaneously back up and restore data from heterogeneous applications. For example, you can partition the library so that it processes commands from Application 1 (about Department A) in Logical Library 1, commands from Application 2 (about Department B) in Logical Library 2, and commands from Application 3 (about Department C) in Logical Library 3. In this configuration, the storage slots and drives in each logical library are dedicated to that library and are not shared among other libraries. Commands issued by the applications travel to the library through three unique control paths. Thus, the data processing for Department A is confined to the storage slots and drives in Logical Library 1, processing for Department B is confined to the storage slots and drives in Logical Library 2, and so forth.

Using Multiple Logical Libraries for Mixed Drive Types

For applications that cannot support Ultrium 1 and Ultrium 2 drives and media in the same logical library, you can use multiple logical libraries to keep them separate.

By using partitioning and logical libraries, you provide investment protection for any Ultrium 1 Tape Drive if your application does not support the mixing of Ultrium 1 and Ultrium 2 Tape Drives and media in the same logical library.

Using Multiple Control Paths

In addition to creating multiple logical libraries, you can also configure any logical library to have more than one control path. When you configure additional control paths, additional library sharing configurations and availability options are made possible. Access to the logical library is on a first-come, first-served basis and each control path for a logical library can accept commands while the library is in use by another control path.

Note: Microsoft Windows® 2000 Removable Storage Manager (RSM) does not support multiple control paths within a logical library. IBM recommends that you disable RSM to use this feature.

To add or remove additional control paths, see “Changing a Control Path” on page 148.

The sections that follow describe two potential uses for multiple control paths.

Using Multiple Control Paths for iSeries and AS/400 Attachment

The use of control paths for the iSeries and AS/400 servers is unique. In general, every iSeries adapter must “see” the control path that is associated with the drives to which it is connected. Different scenarios exist:

- For an HVD SCSI Ultrium 1 Tape Drive, IBM supports single drive configurations so that every HVD Ultrium 1 Tape Drive must have a control path when connected to the iSeries server.
- For HVD and LVD SCSI Ultrium 2 Tape Drives, the iSeries server supports multiple drives that are connected per adapter, and one of the drives must have a control path.
- For the Fibre-Channel-attached drives (both Ultrium 1 and Ultrium 2 Tape Drives), OS/400® V5R1 supports only one drive per adapter and every drive requires a control path.
- For an OS/400 V5R2 Fibre Channel connection, the adapter supports multiple drives per adapter, so that only one control path for the group of drives is required.

Using Multiple Control Paths for Control Path Failover

The UltraScalable Tape Library offers an optional control path failover feature that enables the host device driver to resend the command to an alternate control path for the same logical library. For specific details, see “Data Path Failover, Control Path Failover, and Load Balancing” on page 2.

Supported Servers and Software

The UltraScalable Tape Library is supported by a wide variety of servers (hosts), operating systems, and adapters. These attachments can change throughout the product's life cycle. To determine the latest attachments, or to get a comprehensive list of compatible software, perform one of the following:

- Visit the web at `http://www.ibm.com/storage/lto`. Select `LTO support`, then `Interoperability matrix and software (ISVs)`. Under `Supported servers and operating systems` or `Supported storage management software`, select `IBM TotalStorage UltraScalable Tape Library 3584`.
- Contact your IBM Sales Representative.

Notes:

1. IBM does not provide application software with the UltraScalable Tape Library. To order software, contact your IBM Sales Representative, IBM Business Partner, or an independent software provider.
2. If you attach your library to a non-IBM platform with non-IBM software, IBM recommends that you contact your software vendor to obtain a matrix of compatible hardware, software, firmware revisions, and adapter cards.

Supported Device Drivers

IBM provides device driver support for the Ultrium Tape Drives and the robotics in the UltraScalable Tape Library (including the Model D42 frame). It maintains the latest levels of device drivers and driver documentation on the Internet. Use one of the following procedures to access this material. **(Note: If you do not have Internet access and you need information about device drivers, contact your Marketing Representative.)**

- Using a browser, type one of the following:

  `http://www.ibm.com/storage`

  `ftp://ftp.software.ibm.com/storage/devdrvr`

  `ftp://207.25.253.26/storage/devdrvr`

- Using FTP, enter the following specifications:

  FTP site: `ftp.software.ibm.com`

  IP Addr: `207.25.253.26`

  Userid: `anonymous`

  Password: (use your current e-mail address)

  Directory: `/storage/devdrvr`

The DLT 8000 Tape System is supported by native operating system device drivers. For instructions about installing, configuring, and operating device drivers for the DLT 8000 Tape Systems, refer to the documentation for your operating system or application software.

IBM provides PDF- and PostScript-formatted versions of its documentation in the /storage/devdrvr/Doc directory:

- IBM_ultrium_tape_IUG.ps and IBM_ultrium_tape_IUG.pdf contain the current version of the *IBM Ultrium Device Drivers Installation and User's Guide*
- IBM_ultrium_tape_PROGREF.ps and IBM_ultrium_tape_PROGREF.pdf contain the current version of the *IBM Ultrium Device Drivers Programming Reference*

Device drivers and utilities for each supported server are beneath /storage/devdrvr/ in the following directories (the device driver for the iSeries or AS/400 server is included in the OS/400 operating system).

- AIX
- HPUX
- Linux
- Solaris
- Windows

For more information about device drivers, refer to any of the preceding directories.

Attachment Interfaces

The UltraScalable Tape Library supports three types of attachment interfaces: Fibre Channel, LVD SCSI, and HVD SCSI. In an Ultrium frame, any combination of interfaces for the Ultrium Tape Drive is supported (including Fibre Channel); in a DLT frame, only LVD or HVD SCSI interfaces can be used.

The sections that follow describe the Fibre Channel and SCSI interfaces.

Fibre Channel Interface

Attention: This product contains an assembly that complies with the performance standards set by the U.S. Food and Drug Administration for a Class I Laser Product. This laser assembly is registered with the Department of Health and Human Services and is in compliance with IEC825.

For drives that use a Fibre Channel interface, the following conditions apply:

The 2-Gb interface is a 200-MB-per-second, full-duplex, serial-communications technology capable of interconnecting Ultrium Tape Drives that are separated by as much as 300 meters (984 feet).

Fibre Channel technology combines the best features of traditional input/output (I/O) interfaces (such as the throughput and reliability of SCSI and Programmed Control Interrupt) with the best features of networking interfaces (such as the connectivity and scalability of Ethernet and Token Ring). The technology offers a transport mechanism for delivering commands, and provides high performance by allowing processing to be done in the hardware.

You can establish Fibre Channel connections between Fibre Channel ports that reside in the UltraScalable Tape Library, one or more servers, and the network interconnecting them. The network can consist of such elements as switches, hubs, bridges, and repeaters used in the interconnection.

For more information about the Fibre Channel interface, see Chapter 7, “Using the Fibre Channel Interface”, on page 233.

SCSI Interface

The UltraScalable Tape Library operates as a set of SCSI-3 devices. For drives that use a SCSI interface, the following conditions apply:

- The Ultrium 2 Tape Drive can attach to a server through a Low Voltage Differential (LVD) Ultra160 SCSI interface or a High Voltage Differential (HVD) Ultra SCSI interface
- The Ultrium 1 Tape Drive can attach to a server through an LVD Ultra2 SCSI interface or an HVD Ultra SCSI interface
- The DLT 8000 Tape System can attach to a server through a Fast/Wide LVD or HVD SCSI interface

Each SCSI drive canister uses shielded, VHDCI, 68-pin connectors and can attach directly to a 2-byte-wide SCSI cable.

Note: The earlier version of the SCSI drive used HD68 connectors and was packaged on a tray (sled). While drive trays are still supported, they can no longer be ordered. For information about the replacement design, contact your IBM representative.

Any combination of up to two initiators (servers) and up to four targets (devices) is allowed on a single SCSI bus if the following conditions are met:

- The SCSI bus is terminated properly at each end
- Cable restrictions are followed according to SCSI-3 standards

Under the SCSI-3 protocol, this type of attachment allows cable lengths of up to 25 m (81 ft) with the appropriate cable and terminator for HVD devices and up to 12 m (39 ft) for LVD devices.

For more information about the SCSI interface, see Chapter 8, “Using the SCSI Interface”, on page 241.

Expanded I/O Capacity

To insert cartridges into and remove them from the library (without requiring a reinventory), the library offers an input/output (I/O) station located on the front door of the base frame (Model L32). You can also order an additional I/O station to be installed on the door (if you are using both Ultrium and DLT drives, you automatically receive the additional I/O station).

The upper I/O station contains 10 slots for LTO Ultrium Tape Cartridges. The quantity of storage slots in the lower I/O station varies, depending on whether you use both Ultrium and DLT drives. For LTO Ultrium Tape Cartridges, the lower I/O station contains 20 slots; for DLTtape IV Tape Cartridges, the lower I/O station contains 18 slots.

A frame cannot combine both Ultrium and DLT cartridges. However, in a library that uses DLT drives, you may insert DLTtape IV Tape Cartridges into the lower I/O station of a Model L32 frame for transport (by the cartridge accessor) to a Model D42 frame.

Capacity Expansion Feature

The Capacity Expansion Feature is a license key that lets you enable the use of storage slots inside the front door of the UltraScalable Tape Library. With the Capacity Expansion Feature installed, the library offers 140 additional slots for Ultrium Tape Cartridges in the Model L32 if the second I/O station is not present and 88 additional slots if the second I/O station is present. The Capacity Expansion Feature is required when you add one or more expansion frames (Models D32 or D42) to the base frame.

When you purchase your library, you may specify that the Capacity Expansion Feature be installed at the factory, or you may order the feature later and have your IBM Service Representative install it. To order the Capacity Expansion Feature, contact your IBM Sales Representative.

To determine the quantity of LTO Ultrium Tape Cartridges and DLTtape IV Tape Cartridges that the library supports, see Appendix A, “Frame Capacity”, on page 255.

Web Interface

The library’s web interface, known as the IBM TotalStorage UltraScalable Tape Library Specialist, enables operators and administrators to manage storage devices from any location in an enterprise. The UltraScalable Specialist allows you to communicate directly with your UltraScalable Tape Library and perform a full range of end user, operator, and administrator tasks without being at the operator panel.

The UltraScalable Specialist requires a Category 5 Ethernet cable (not supplied with the tape library). It may be installed by you or your IBM Service Representative.

For information about using the UltraScalable Specialist web interface, see “Operating the Library from the Web” on page 64.

Remote Support

Optional remote support is available for the UltraScalable Tape Library through its Call Home capability. This feature minimizes the time it takes to correct both drive and library problems. It uses a modem connection to report failures that are detected by the drive or the library. Whenever a failure is detected, the Call Home feature sends detailed error information to IBM. The IBM Service Representative can then prepare an action plan to handle the problem before traveling to the library.

Hardware requirements for the remote support function vary, depending on whether you already have one or more IBM tape products that have the remote support capability. Table 4 indicates the requirements.

Table 4. Requirements for remote support (the Call Home feature)

Quantity of IBM Tape Products with Remote Support Capability	Requirement
1	Remote Support Facility (modem and cable; feature code #2710)
2	Remote Support Switch (feature code #2711). This feature applies only if you are attaching multiple libraries to one modem.
3 or more	Remote Support Attachment (cable; feature code #2712)

Drive Cleaning

The head of every tape drive in the UltraScalable Tape Library must be kept clean to prevent errors caused by contamination. To help you keep the drives clean, IBM provides a cleaning cartridge with the library. Whenever a drive determines that it needs to be cleaned, it alerts you with a message on the library's display or host console. The library uses the cleaning cartridge to clean the drive with whatever cleaning method that you choose. In all methods, cleaning is performed after the data cartridge has been unloaded from the drive and before the next load.

Three methods of cleaning are available:

Automatic cleaning (preferred)

Automatic cleaning enables the library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process. The cleaning process is transparent to any host application that uses the library. You can enable or disable automatic cleaning by using the library's operator panel or by using the UltraScalable Specialist web interface. The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. It applies to all logical libraries that are configured for the UltraScalable Tape Library. For more information, see "Enabling or Disabling Automatic Cleaning" on page 78.

Host cleaning

Host cleaning enables the server (host) to detect the need to clean an Ultrium Tape Drive or a DLT 8000 Tape System, and to control the cleaning process. Host cleaning with a cleaning cartridge is only supported when you disable automatic cleaning and only for the logical library in which each cleaning cartridge is stored. When you enable automatic cleaning, or when the cleaning cartridge is stored in a different logical library, the host application does not have access to the cleaning cartridge. For more information, see the section about cleaning in your application software's documentation.

Manual cleaning

Manual cleaning requires that you select a menu option from the library's operator panel or UltraScalable Specialist web interface to perform cleaning on one or more of the tape drives. Manual cleaning is always supported, regardless of whether automatic cleaning is enabled or disabled. For more information, see "Performing a Manual Cleaning Operation" on page 84.

IBM recommends that you make sure that the automatic cleaning method is always enabled. By continually keeping itself clean, a drive does not shut itself down because of improper maintenance or contaminants that cause the drive to fail.

TapeAlert Support

The UltraScalable Tape Library is compatible with TapeAlert technology, which provides error and diagnostic information about the drives and the library to the host application. The library provides this information as TapeAlert *flags* that are reported to the application by the SCSI LOG SENSE command.

Appendix C, "TapeAlert Flags", on page 265 defines the TapeAlert flags for the drives and the library.

SNMP Messaging

Occasionally, the library may encounter a situation that you want to know about, such as an open door that causes the library to stop. Because many servers can attach to the UltraScalable Tape Library by differing attachment methods, the library provides a standard TCP/IP protocol called Simple Network Management Protocol (SNMP) to send alerts about conditions (such as an opened door) over a TCP/IP LAN network to an SNMP monitoring server. These alerts are called SNMP traps. Using the information supplied in each SNMP trap, the monitoring server (together with customer-supplied software) can alert operations staff of possible problems or operator interventions that occur. Many monitoring servers (like Tivoli Netview) can be used to send e-mail or pager notifications when they receive an SNMP alert (for more information, see your Tivoli Netview documentation or the manuals for your network management application).

The monitoring server must be loaded with systems management software that can receive and process the trap, or the trap is discarded. SNMP trap support does not provide a mechanism for the operator to gather more information about a problem or to query the library about its current status.

Figure 8 shows the flow of SNMP traps from the library over the Ethernet local area network (LAN) to an SNMP monitoring server.

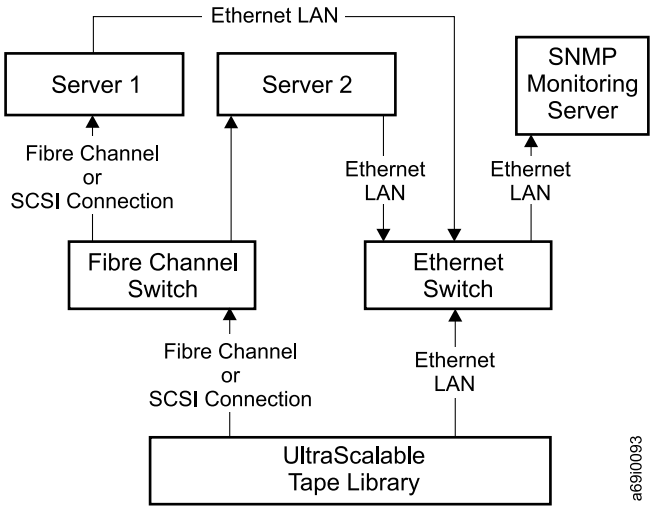

Figure 8. The SNMP messaging system. The UltraScalable Tape Library issues SNMP traps to an SNMP monitoring server.

For information about interpreting an SNMP trap, see “Interpreting SNMP Traps” on page 251.

Drive Performance

If you run applications that are highly dependent on tape-processing speed, you can take advantage of the significant performance improvements provided by the Ultrium Tape Drives and the DLT Tape System. Table 5 lists the performance characteristics of each.

Table 5. Performance characteristics of the Ultrium Tape Drives and the DLT Tape System

Performance Characteristic	Tape Drive		
	Ultrium 2 Tape Drive	**Ultrium 1 Tape Drive**	**DLT Tape System**
Native sustained data rate	35 MB/s (with Ultrium 2 media) 20 MB/s (with Ultrium 1 media)	15 MB/s	6 MB/s
Compressed data rate (at 2:1 compression)	70 MB/s (with Ultrium 2 media) 40 MB/s (with Ultrium 1 media)	30 MB/s	12 MB/s
Maximum sustained data rate (at maximum compression)	110 MB/s	60 MB/s	12 MB/s
Burst data rate for Fibre Channel drives	200 MB/s	100 MB/s	Not applicable
Burst data rate for Low Voltage Differential (LVD) SCSI drives	160 MB/s (Ultra160)	80 MB/s (Ultra2)	20 MB/s (Fast/Wide)
Burst data rate for High Voltage Differential (HVD) SCSI drives	40 MB/s (Ultra)	40 MB/s (Ultra)	20 MB/s (Fast/Wide)
Nominal load-to-ready time	15 seconds	20 seconds	130 seconds (formatted) 133 seconds (unformatted)
Nominal unload time	15 seconds	18 seconds	21 seconds
Average search time to first byte of data	49 seconds	73 seconds	60 seconds
Note: All sustained data rates are dependent on the capabilities of the interconnect (for example, an Ultra SCSI bus is limited to less than 40 MB/s).			

By using the built-in data-compression capability of the tape drives, you can achieve greater data rates than the native data transfer rate. However, the actual throughput is a function of many components, such as the host system processor, disk data rate, block size, data compression ratio, SCSI bus capabilities, and system or application software. Although the UltraScalable Tape Library is capable of a 18-TB/hour rate with Ultrium 2 Tape Drives (at 2:1 compression), other components of the system may limit the actual effective data rate.

For maximum performance with SCSI drives, multiple SCSI buses may be required and the UltraScalable Tape Library devices must be the only target devices that are active on each SCSI bus. For more information, see Chapter 8, “Using the SCSI Interface”, on page 241.

Library Performance

The following performance values, whether measured on test systems or modeled through simulations, are based on a fixed set of workload assumptions to ensure accurate comparisons; however, the results were not evaluated in all production environments. Thus, the performance values show the relative performance of the systems and may not be absolute indicators of performance in your specific environment.

Some of the specific assumptions may not pertain to a given operating environment. Actual performance may vary. Accordingly, the performance information in this section does not constitute a performance guarantee or warranty. Verify that the performance of the library is acceptable in your specific environment.

Cartridge Inventory Times

The typical time required for the library to inventory cartridges is less than 60 seconds per frame.

A cartridge inventory operation includes a check to determine whether each cartridge storage slot in the library is empty or full, and a scan of the bar code labels. An inventory occurs whenever you:

- Power-on the UltraScalable Tape Library
- Issue the SCSI Initialize Element Status with Range command
- Select the appropriate menus from the UltraScalable Specialist web interface (see “Performing an Inventory of the Library” on page 106)
- Go to the library’s operator panel and select Inventory from the Manual Operations menu
- Close the front door after manually accessing the inventory

Note: The UltraScalable Tape Library tracks the logical location of all elements in the library by performing an automatic inventory as required (if you issue the SCSI Initialize Element Status command, it is allowed but ignored). The automatic inventory improves application audit performance.

When the library performs an automatic inventory because the front door was closed, the inventory occurs only for those frames whose doors have been opened.

Cartridge Move Times

Move time is the time required for the cartridge accessor to pick a cartridge from a random slot, move the cartridge to a drive, pivot (if required), and insert the cartridge into the drive.

Table 6 lists the average move times for the UltraScalable Tape Library.

Table 6. Average move times of Ultrium Tape Drives

Library Configuration	Average Move Time in Seconds
1 frame	2.4
2 frames	2.5
4 frames	3.0
6 frames	3.8
8 frames	4.9
12 frames	6.5
16 frames	8.0
Note: Some results for the Ultrium Tape Drives were produced from models, but are consistent with expectations.	

Mount Throughput

Mount throughput is a measure of the overall capability of the cartridge accessor and tape drives. It is defined as the number of cartridges that the tape library can mount in one hour. A mount, often called the mount/demount cycle, involves removing the cartridge from a drive, returning it to its storage slot, collecting another cartridge from a random storage slot, moving it to the drive, and loading the cartridge into the drive.

Table 7 shows the mount throughput performance for the UltraScalable Tape Library.

Table 7. Mount throughput rate of Ultrium Tape Drives

Library Configuration	Mounts Per Hour
1 frame	600
2 frames	515
4 frames	405
6 frames	340
8 frames	265
12 frames	205
16 frames	165
Note: Some results for the Ultrium Tape Drives were produced from models, but are consistent with expectations.	

Chapter 2. Physical Planning Specifications

For optimum operation of the IBM TotalStorage UltraScalable Tape Library 3584, make sure that you place it in an environment that meets the requirements described in the following sections. The UltraScalable Tape Library is installed by an IBM Service Representative.

Physical Specifications

The UltraScalable Tape Library requires one base frame (Model L32 for LTO Ultrium Tape Cartridges), which includes the cartridge accessor and associated components. You can optionally add expansion frames to increase the storage capacity of the library. The frames join end to end, with the base frame on the left and the expansion frame on the right. To calculate the length of your fully configured library, see Table 9 and Figure 10 on page 35.

Each frame has a set of casters and 4 leveling jackscrews. The nominal height from the bottom of the jackscrews to the top of the frame is 1840 mm (72.4 in.) and can be varied by ±40 mm (±1.6 in.). The shipping height of the library (on its casters and with jackscrews raised) is 1800 mm (70.9 in.).

Table 8. Physical characteristics of the IBM TotalStorage UltraScalable Tape Library 3584

Physical Characteristic	**Measurement**		
Height of frame (on casters)	1800 mm (70.9 in.)		
Width of frame	725 mm (28.5 in.)		
Depth of frame	1520 mm (59.8 in.)		
	Model L32	**Model D32**	**Model D42**
Weight of base frame with 1 drive and 0 cartridges	425 kg (937 lb)	- -	- -
Weight of base frame with 12 drives and maximum cartridges (227 Ultrium Tape Cartridges)	570 kg (1256 lb)	- -	- -
Weight of expansion frame with 0 drives and 0 cartridges	- -	355 kg (784 lb)	355 kg (784 lb)
Weight of expansion frame with 12 drives and maximum cartridges (396 Ultrium Tape Cartridges or 324 DLTtape IV Tape Cartridges)	- -	558 kg (1229 lb)	557 kg (1227 lb)
Note: The weight with cartridges assumes a cartridge weight of .209 kg (.461 lb) for a standard LTO Ultrium Tape Cartridge or .220 kg (.485 lb) for a standard DLTtape IV Tape Cartridge. The actual weight of the library varies, depending on the configuration and cartridge capacity.			

Floor Requirements

Install the library on a raised or solid floor. The floor must have a smooth surface and, if raised, must not have ventilation panels beneath the leveling jackscrews. If carpeted, ensure that the carpet is approved for computer-room applications.

To accommodate unevenness in the floor, you can raise or lower the leveling jackscrews to the following specifications:

- Maximum allowable variance must not exceed 7 mm (.27 in.) per 76 mm (3 in.).
- Maximum out-of-level condition must not exceed 40 mm (1.6 in.) over the entire length and width of the library.

The floor on which the UltraScalable Tape Library is installed must be able to support:

- Up to 4.8 kilograms per square centimeter (68.6 lb per square inch) of point loads exerted by the leveling jackscrews
- Up to 211 kilograms per square meter (43.4 pounds per square feet) of overall floor loading

The number of point loads exerted depends on the number of frames that make up the library. There are four point loads per frame (located at the corners of each frame).

Delivery Route

Check the delivery route that the library must travel from your loading dock to the installation location. Ensure that the library will fit through all doors, hallways, and elevators.

You must remove the library from the pallet and place it at the final location before you call your IBM Service Representative to arrange for the installation. Refer to the instructions on the shipping carton for correct unpacking procedures.

Security

To prevent unauthorized access to data, IBM recommends locating the UltraScalable Tape Library and all shelf-resident cartridges in an area where access is controlled.

You are responsible for the physical security of the library, the cartridges contained within the library, and shelf-resident cartridges. The I/O stations have locking mechanisms that prevent you from opening an I/O station door when the accessor is manipulating cartridges in a station.

The library's front door has a keylock. The keylock is the same for every front door, and the keys are shipped with the library. The library's rear door has a different keylock. The keylock is the same for every rear door and the keys are shipped with the library.

You are also responsible for evaluating, selecting, and implementing security features, administrative procedures, and appropriate controls in application systems and communication facilities.

Data security is the responsibility of the application program controlling the library.

Move Restraints

Should you want to restrain the UltraScalable Tape Library from potential movement (for example, from earthquake), restraining points are located at the bottom of the unit (see **1** in Figure 9). Affix restraints to each of the four points (two on each long side) and secure the library as needed.

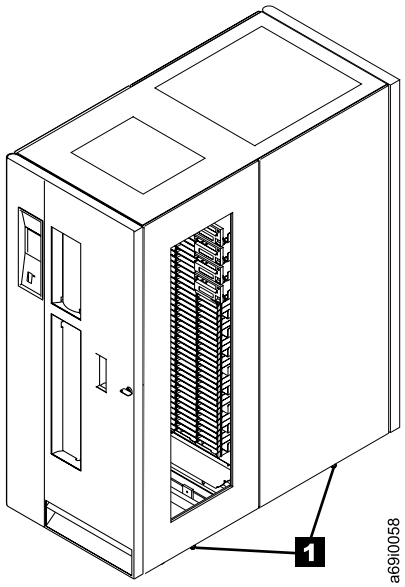

Figure 9. Location of restraining points. Two restraining points are located on each long side of the library.

Clearance Specifications

Plan for appropriate clearances around your UltraScalable Tape Library to allow you and IBM Service Representatives to use and work on it. Operator clearance is required in front of all frames; service clearance is required as follows:

- In front of and behind the base frame and expansion frames.
- At one or both ends of the library, depending on the following conditions:
  - At one end if the library contains fewer than three frames.
  - At both ends if the library contains three or more frames; this access allows the IBM Service Representative to see the two-character display on the left of the cartridge accessor.

Ensure that clearance space does not overlap into walkways and other access areas. As you plan clearances, be sure to leave room on the library's right end (as you face the front door) for future expansion.

Table 9 on page 34 shows the length of the library, including side clearances; Figure 10 on page 35 shows the location of the clearances.

Table 9. Clearance requirements for an UltraScalable Tape Library

Number of Frames	Length of A in Figure 10 on page 35
1	2275 mm (89.57 in.)
2	3029 mm (119.25 in.)
3	3784 mm (148.98 in.)
4	4538 mm (178.66 in.)
5	5293 mm (208.39 in.)
6	6048 mm (238.11 in.)
7	6802 mm (267.80 in.)
8	7557 mm (297.52 in.)
9	8311 mm (327.21 in.)
10	9066 mm (356.93 in.)
11	9821 mm (386.65 in.)
12	10575 mm (416.34 in.)
13	11330 mm (446.06 in.)
14	12084 mm (475.75 in.)
15	12839 mm (505.47 in.)
16	13594 mm (535.20 in.)
Note: The size of a clearance is measured by its depth from the outside of the frame and its width along the library. At the ends of the library, the depth of the service clearance is measured from the front of the library to the rear. In Figure 10 on page 35, B refers to the distance (3044 mm or 119.8 in.) that is the total service clearance between the front and the rear of the library.	

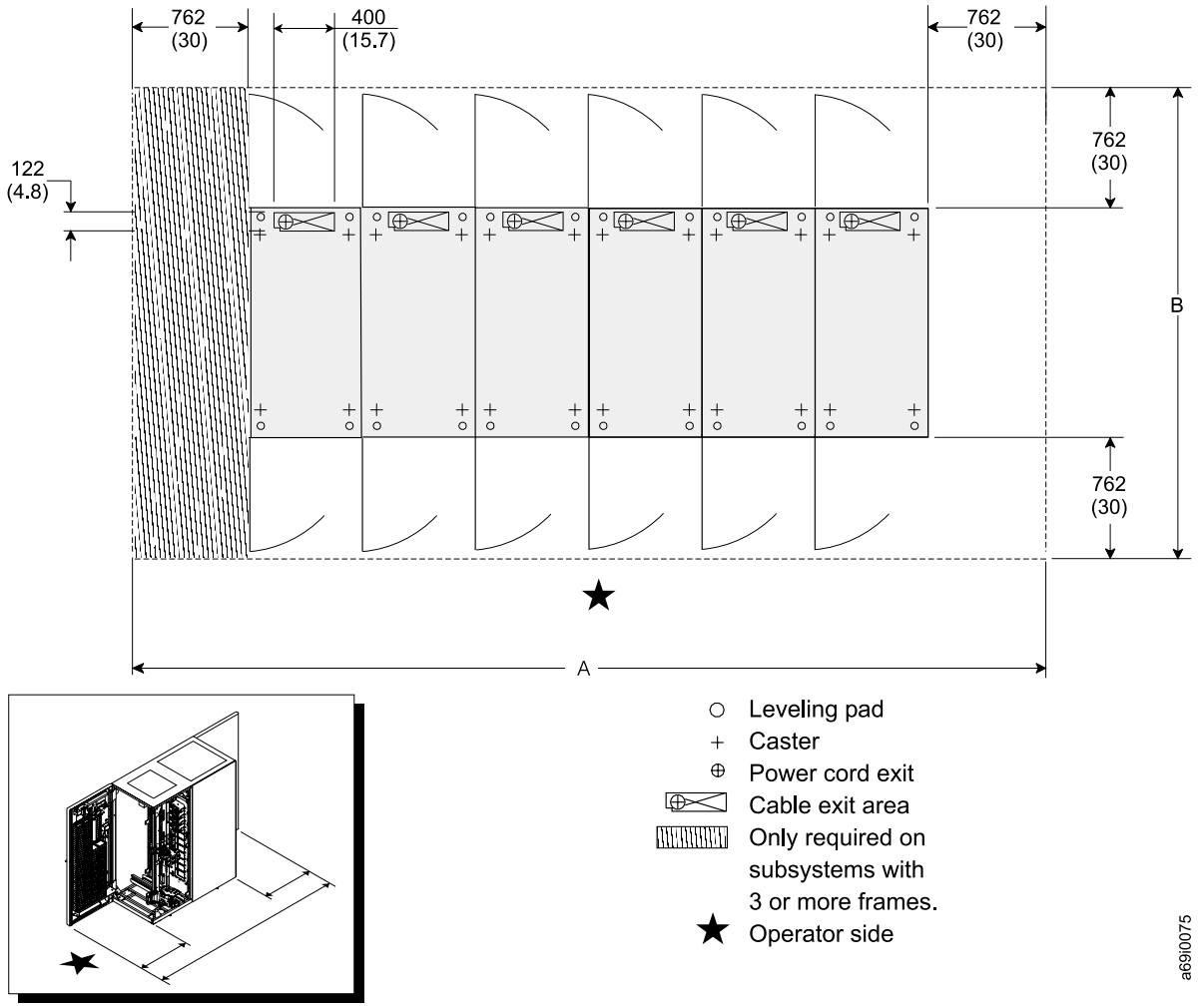

Figure 10. Size of operator and service clearances for the IBM TotalStorage UltraScalable Tape Library 3584. The top measurements are in millimeters; the bottom measurements are in inches. The service clearance area (and operator clearance area at the front of both frames) is denoted by dotted lines.

Fire-Suppression Provisions

The UltraScalable Tape Library allows for mechanical connections to permit third-party installation of fire-suppression equipment. When deciding whether to implement fire-suppression equipment, refer to your local and national standards and regulations.

Each frame in the library has an allowable area on the top that may be cut to allow entrance of pipes, conduits, or other parts (see **1** in Figure 11). The area is 82.7 mm (3.3 in.) wide by 504.7 mm (19.8 in.) long. The equipment can extend through the top cover for a maximum intrusion of 175 mm (6.9 in.).

Note: Do not cut the opening larger than required.

Within the frame, a depth of 175 mm (6.9 in.) is available for installing pipes, sensors, sprinklers, or other components. Piping, conduits, and cabling can be run from frame to frame only if they stay within an allowable area (see **2** in Figure 11) and do not interfere with library components.

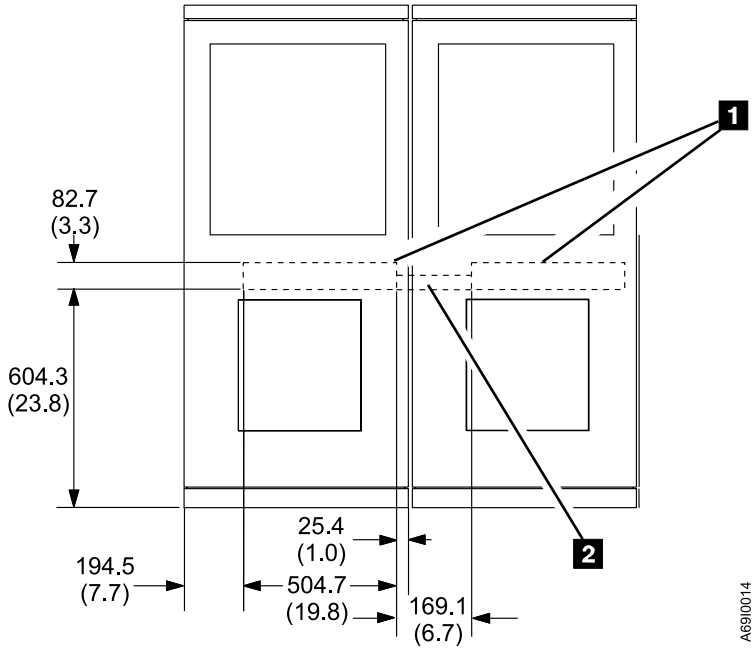

Figure 11. Allowable area for mounting fire-suppression equipment (top view of frames)

Figure 12 shows a side view of the area available to run cables, wiring, and pipes between frames. The area is a triangular section that is 81 mm (3.2 in.) wide by 140 mm (5.5 in.) long (see **1**). Your fire-suppression mechanical equipment must fit within the allowable area or be installed outside the library.

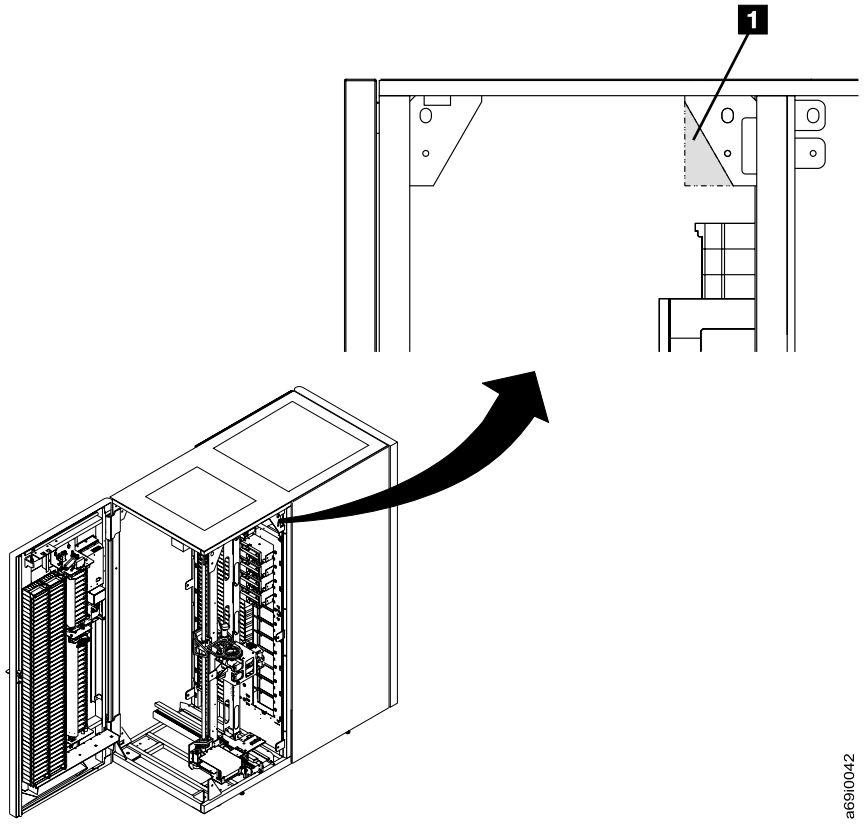

Figure 12. Location for routing fire-suppression equipment between frames

All water systems must be external to the library's frame, with mechanical support provided for piping. Sprinkler heads that extend through the top of the frame must not extend more than 175 mm (6.9 in.) below the top of the frame.

Route gaseous system piping with discharge nozzles on the top of the frames or inside the frames, below the top of the frame and within the 175-mm (6.9-in.) specification. The discharge nozzles can extend vertically no lower than 175 mm (6.9 in.) from the top of the frame. Gas cylinders and control equipment must be external to the library. IBM does not supply heat or smoke detectors.

Environmental Specifications

Attention: The environments in Table 10 refer to the library's hardware and may lead to temperatures greater than allowable for the cartridges and media stored in the library. For frames that contain Ultrium Tape Cartridges, see "Environmental and Shipping Specifications for Tape Cartridges" on page 214. For frames that contain DLTtape IV Cartridges, see "Environmental and Shipping Specifications for Tape Cartridges" on page 229. Then, adjust the operating environment for the library accordingly.

Table 10. Environmental specifications for the IBM TotalStorage UltraScalable Tape Library 3584

Environment	Temperature	Relative Humidity	Maximum Wet Bulb Temperature
Operating	16 to 32°C (61 to 90°F)	20 to 80%	23°C (73.4°F)
Nonoperating	16 to 32°C (61 to 90°F)	20 to 80%	26°C (79°F)
Storage	1 to 60°C (34 to 140°F)	5 to 80%	29°C (84°F)
Shipping	–40 to 60°C (–40 to 140°F)	5 to 100% (excluding precipitation)	29°C (84°F)

Acoustical Specifications

Table 11 lists the acoustical specifications for the UltraScalable Tape Library. When the library is both operating and idling, the following conditions apply:

- Power is on.
- All air-moving devices are operating.
- Tape cartridges are loaded in all drives.

When the library is operating, the cartridge accessor loads, unloads, or moves tape cartridges; when the library is idling, the accessor does not move.

Table 11 gives the noise emission values for the library. The UltraScalable Tape Library is a Category 1 product as defined in C-S 1-1710-006.

Table 11. Noise emission values for the IBM TotalStorage UltraScalable Tape Library 3584

L_{WAd}		$<L_{pA}>m$	
Operating (bels)	**Idling (bels)**	**Operating (dB)**	**Idling (dB)**
7.5	7.4	51	50

Notes:

1. L_{WAd} = Declared (upper limit) sound power level
2. L_{pAm} = Mean value of the A-weighted sound pressure level at the operator position (if any)
3. $<L_{pA}>m$ = Mean value of the A-weighted sound pressure levels at the one-meter (bystander) positions

All measurements are in accordance with ANSI S12.10, and conform with ISO 9296. For definitions of levels, see the *IBM General Information Installation Manual-Physical Planning.*

Power and Cooling Specifications

Power and cooling for UltraScalable Tape Library components are provided by the frame in which they are housed. Each base frame and each expansion frame that contains drives has its own frame control assembly (FCA), which receives power from a customer-supplied outlet and, in turn, provides ac power to all tape drives within the frame. The FCA and tape drives have their own cooling as part of their packages, but air must be allowed to flow freely from the top of the library. Therefore, do not stack cartridges, books, or other materials on the top of the library. No further external cooling is required by the tape library. For redundancy, the FCA in the base frame (Model L32) contains two dc power supplies for the accessor. If an optional FCA is installed in an expansion frame (Model D32 or Model D42), it will contain one dc power supply for the accessor. The FCA is not required in expansion frames that contain no tape drives.

Each frame receives single-phase (200-240 V ac) power on its own power cord from a customer-supplied outlet. Certain countries or regions require two-phase power to achieve the 200-240 V ac required by the frame.

Countries in North America have the option of operating at 100-127 V ac power (feature code 9951).

Table 12 lists the power requirements for the base frame (Model L32) and the expansion frames (Models D32 and D42) in the UltraScalable Tape Library.

Table 12. Power requirements for frames in the IBM TotalStorage UltraScalable Tape Library 3584

Power Requirement	Models L32, D32, or D42	
	220 V ac Line Cord	**110 V ac Line Cord**
ac line voltage	200 to 240 V ac (nominal)	100 to 127 V ac (nominal)
Line frequency	50 to 60 Hz	50 to 60 Hz
Nominal power	1.4 kW	1.2 kW
Line current	8.0 A	12.0 A
kVA	1.6 kVA	1.2 kVA
Heat output	4.8 kBtu/hr	4.1 kBtu/hr
Inrush current	200 A (peak for 1/2 cycle)	100 A (peak for 1/2 cycle)

The appropriate power cord for the UltraScalable Tape Library is attached at the factory (based on the destination code of your country or region). Chicago, Illinois (U.S.A.) requires a 1.8-m power cord (feature code 9986). Power cords used in the United States and Canada are listed by the Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA). Table 13 on page 41 lists the 200 to 240 V ac power cords to use with the UltraScalable Tape Library (the term "power cord" refers to the cable that connects the library to the receptacle). Table 14 on page 42 lists the 100 to 127 V ac power cords.

Be aware that each frame that contains an FCA is protected by a main line circuit protector in the FCA. Each FCA must be further protected by a circuit breaker of the proper rating at the service rail (customer outlet).

The service rating for all 200 to 240 V ac plug types is as follows:

- Maximum voltage: 250 V ac
- Current: see Table 13
- Phases: 1
- Wires: 3

Table 13. Specifications for 200 to 240 V ac power cord used with the IBM TotalStorage UltraScalable Tape Library 3584

Length and Type of Power Cord	Single Branch Circuit 30A Service Rating		Dual ac Line Cords 15 A Service Rating (Feature Code 1901)	
	Part Number/ Feature Code	Type of Service Receptacle	Part Number/ Feature Code	Type of Service Receptacle
4.3 m (14 ft) non-watertight, twistlock (in U.S. and Canada)	11F0113/ 9987	NEMA style L6-30R	14F1550/ 9987	NEMA style L6-15R
4.3 m (14 ft) (in countries or regions other than the U.S. and Canada)	46F6063/ None	Per local requirements	36L8823/ None	IEC-60309
4.3 m (14 ft) watertight (default in the U.S. and Canada)	46F4594/ Standard	Russellstoll 3933/F35520 3933 9C33U0 3753 9R33U0W	86F2646/ 9988	Russellstoll 3933/F35520 3933 9C33U0 3753 9R33U0W
1.8 m (6 ft) watertight (in Chicago, Illinois, U.S.)	46F4593/ 9986	Russellstoll 3933/F35520 3933 9C33U0 3753 9R33U0W	Not offered	

The service rating for all 100 to 127 V ac plug types is as follows:

- Maximum voltage: 125 V ac
- Current: see Table 14
- Phases: 1
- Wires: 3

Table 14. Specifications for 100 to 127 V ac power cords used with the IBM TotalStorage UltraScalable Tape Library 3584

Length and Type of Power Cord	Single Branch Circuit 20A Service Rating		Dual ac Line Cords 20 A Service Rating (Feature Code 1901)	
	Part Number/ Feature Code	Type of Service Receptacle	Part Number/ Feature Code	Type of Service Receptacle
4.3 m (14 ft) non-watertight, twistlock (in North America)	19P5903/9951 and 9987	NEMA style L5-20R	12J5117/9951 and 9987	NEMA style L5-20R
1.8 m (6 ft) non-watertight, twistlock (in Chicago)	19P5904/9951 and 9986	NEMA style L5-20R	12J5115/9951 and 9986	NEMA style L5-20R

Chapter 3. Main Components

This chapter describes the main components of the IBM TotalStorage UltraScalable Tape Library 3584 (the library's technical components are described in Appendix B, "Technical Components", on page 257).

Main Components

Figure 13 shows the main components of the UltraScalable Tape Library. The sections that follow describe each component.

1. Library frame
2. Cartridge storage slots
3. Tape drive
4. Front door
5. Door safety switch
6. Upper I/O station
7. Lower I/O station
8. Operator panel
9. Control port

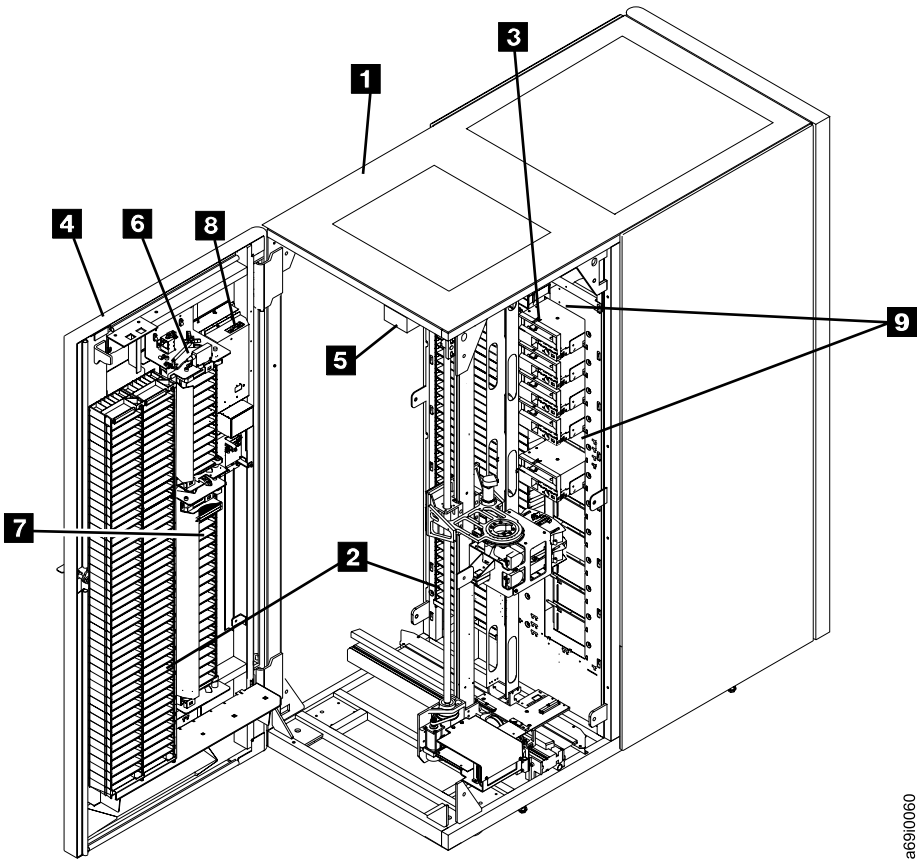

Figure 13. Main components of the IBM TotalStorage UltraScalable Tape Library 3584 Model L32. The front door is open and the side of the library is cut away to show the components.

Library Frame

The library frame (**1** in Figure 13 on page 43) is the basic building block for the UltraScalable Tape Library. The library includes one base frame (Model L32) and two types of expansion frames:

- Model D32 for LTO Ultrium Tape Drives
- Model D42 for DLT 8000 Tape Systems

Each frame is .75 m (29.5 in.) wide, and contains a rail assembly, cartridge storage slots, and up to 12 tape drives. The base frame includes:

- Cartridge accessor
- Accessor controller
- Upper input/output (I/O) station with 10 storage slots for Ultrium Tape Cartridges
- Lower I/O station with 20 storage slots for Ultrium Tape Cartridges or 18 storage slots for DLT Tape Cartridges

  Note: The lower I/O station is optional for libraries that use a single type of media and required for libraries that use both LTO Ultrium and DLT media.
- Operator panel
- Operator panel controller

All components of the UltraScalable Tape Library are contained inside the frames. The tops of the frames have windows that admit ambient lighting. Windows are also located at each end of the library.

Located at the front of each frame is a front door. The door lets you access the cartridge storage slots and allows service personnel to access the rail assembly, cartridge accessor, and accessor controller. The front door of the base frame (Model L32) includes the operator panel, power switch, I/O stations, handle for opening the door, and keylock. The front door of the expansion frame (Model D32 or Model D42) also includes a handle and a keylock.

Inside each frame, cartridge storage slots are mounted on the interior of the front door. Opposite the front door, cartridge storage slots and drives are mounted on the frame wall. The cartridge accessor accesses these storage slots and drives.

At the rear of each frame is a service access door that lets service personnel access the tape drives, control ports (for Model D42 only), and frame control assembly (see **12** in Figure 4 on page 7). For each frame that contains at least one installed drive the assembly also contains a frame control box (FCB), a sheet-metal unit that houses circuit breakers, ac outlets for powering the tape drives and all other components in that frame, and a receptacle for the incoming main ac power.

Up to 5 expansion frames (Model D32 or Model D42) can be added to the base frame. Expansion frames are attached to the right of the base frame (as you face the operator panel), and are numbered consecutively from left to right.

Cartridge Storage Slots

Cartridge storage slots (**2** in Figure 13 on page 43) are mounted inside the library's frames and store tape cartridges. Each storage slot has a unique address to indicate its physical location. The storage slot's address consists of three values:

Frame number
: Represented as `Fx`, where `F` equals the frame and `x` equals its number. For the base frame, the frame number is 1; for each adjacent expansion frame, the frame number increments by one.

Column number
: Represented as `Cyy`, where `C` equals the column and `yy` equals its number. For each frame, the left frame wall column is column number 1. The column number increments in a zig-zag pattern, alternating between the frame wall and the door wall, and progressing from left to right (see Figure 14 on page 46). Thus, all column numbers on the frame wall are odd numbers, and all column numbers on the door wall are even numbers. The base frame (Model L32) has eight columns; the expansion frame (Model D32 or D42) has ten columns.

Row number
: Represented as `Rzz`, where `R` equals the row and `zz` equals its number. For each column, the row number is 1 for the top storage position in a column and increments by one for each row below the top position. Regardless of whether a storage slot is installed in row number 1, the row numbering is the same for every column.

For example, the storage slot address F02,C03,R22 means:

F02 Frame 2 (first expansion frame)

C03 Column 3 (second column from left on drive side)

R22 Row 22 (twenty-second position down from the top of the column)

Cartridge storage slots vary in color, depending on the type of frame. Storage slots in LTO Ultrium frames are black; storage slots in DLT frames are gray.

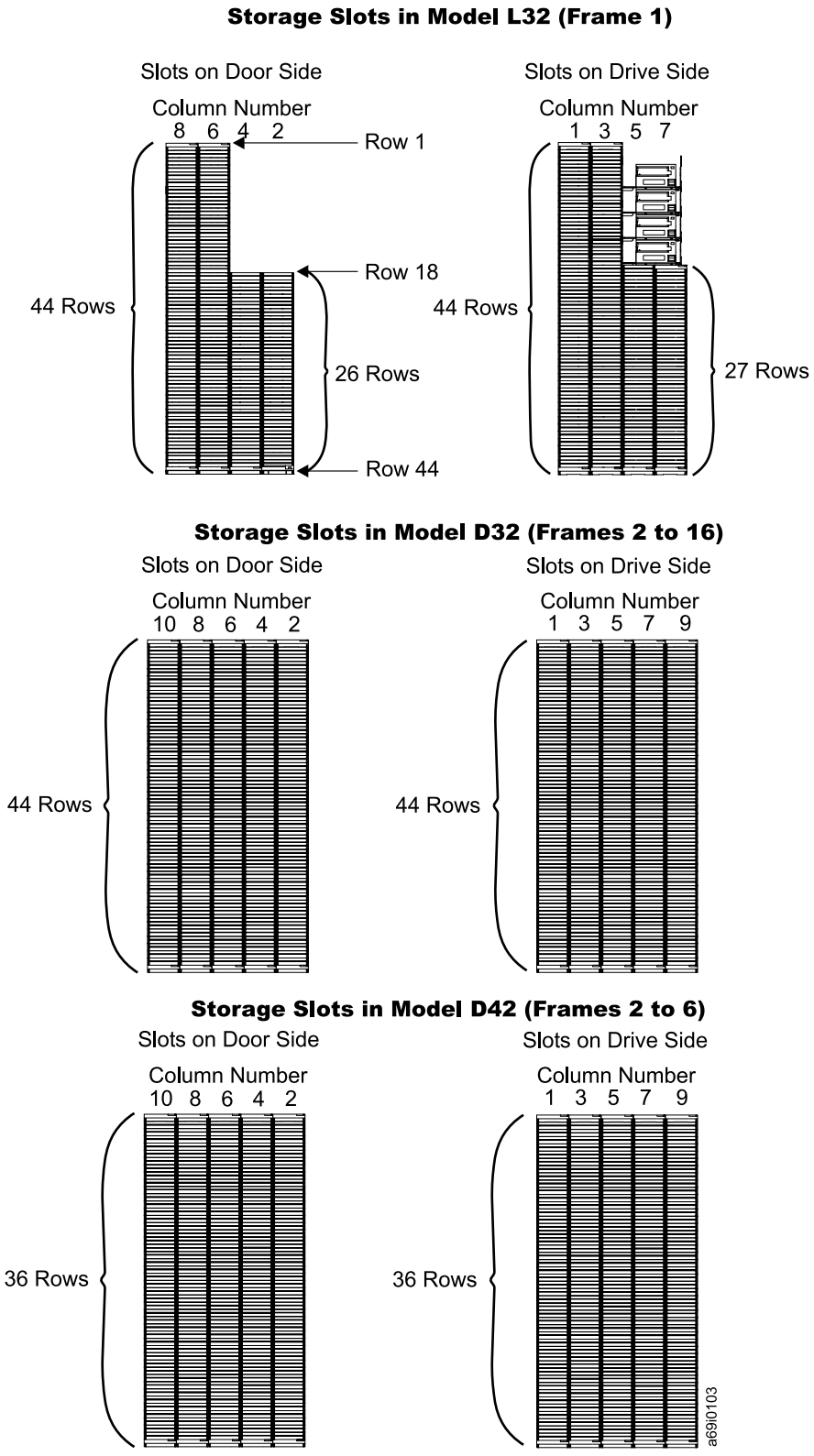

Figure 14. Frame, column, and row numbers. Use this numbering scheme to determine the physical address (location) of each LTO and DLT storage slot. For all possible combinations of storage slots, drives, and I/O slots, see Appendix D, "Locations and Addresses of SCSI Elements", on page 271.

Addressable Cartridge Storage Slots

Addressable storage slots have both a physical address, such as F01,C05,R19, and a SCSI element (logical) address, such as 1112(X'458'). They do not include I/O station slots or the non-addressable slots that are reserved for the diagnostic cartridges (see “Non-Addressable Cartridge Storage Slot”). A library frame contains a variable number of addressable storage slots, depending on the type of tape cartridge that it uses, the quantity of I/O stations that are installed, and the quantity of drives that are installed on the drive side. To determine the quantity of slots available for each frame, see Appendix A, “Frame Capacity”.

The UltraScalable Tape Library stores cleaning cartridges in addressable cartridge storage slots and as part of the normal inventory. If the automatic cleaning feature is enabled, the cleaning cartridges are not accessible by the host software.

To identify SCSI element addresses for cartridge storage slots, see “Determining SCSI Element Addresses” on page 280.

Non-Addressable Cartridge Storage Slot

The Model L32 base frame contains one non-addressable cartridge storage slot for the LTO Ultrium Diagnostic Cartridge at physical address F01,C01,R01. The first Model D42 expansion frame contains two non-addressable cartridge storage slots for the DLT Diagnostic Cartridge at physical addresses Fx,C01,R01 and Fx,C01,R02 (where x equals the first expansion frame for the second type of media). Non-addressable cartridge storage slots do not have SCSI element addresses. There are no non-addressable slots in the Model D32 expansion frame.

Tape Drives and Control Ports

Each frame in the UltraScalable Tape Library can contain one of the following types of tape drives:

- IBM Ultrium 2 Tape Drive
- IBM Ultrium 1 Tape Drive
- DLT 8000 Tape System (and companion control port)

Your commands for library operations and their responses pass through one or more Ultrium Tape Drives or control ports to the accessor controller circuit board located on the accessor. The accessor controller handles all requests that require motion of the accessor, including calibrations, movement of cartridges, and inventory updates. Because the accessor controller (and other components of the library) has no direct access to a server, the Ultrium Tape Drive or control port serves as a conduit for communication between the two and interprets the protocol. (For information about the accessor controller, see “Accessor Controller” on page 259.)

Drive or Control Port Rows

Two types of configurations are possible for the drives and the control ports in the UltraScalable Tape Library:

- For LTO Ultrium frames (Model L32 and Model D32), up to 12 LTO tape drives can be placed into rows 1 through 12. Row 0, if present, is not used.
- For DLT frames (Model D42), the 13 rows can hold at least one control port and up to 12 DLT tape drives. Rows are numbered 0 through 12. In DLT frames, Row 0 is reserved for a control port and cannot contain a drive. Rows 1 through 12 may contain DLT drives or control ports. A frame can only contain one type of media; it cannot contain both LTO Ultrium and DLT drives or tape cartridges.

  Note: Because a control port does not bear a logical library bar code label and cannot be scanned by the bar code reader to determine if it is part of a logical library, the library senses and treats a control port as belonging to the logical library of the first DLT drive that follows it. For this reason, at least one DLT drive must be installed after the last control port, either in a row below the last control port or in a subsequent DLT frame within the same logical library.

Certain conditions apply to mixing drives and media. To learn about compatible combinations, see “Mixing Drive Types in Frames” on page 11.

Figure 13 on page 43 shows the location of a tape drive **3** and a control port **9** in the UltraScalable Tape Library (the actual control port is visible from the rear of the library).

The sections that follow describe each type of tape drive in the UltraScalable Tape Library. For information about rear access to the drives or control ports, see “Drive and Power Supply Compartment” on page 261.

Ultrium Tape Drives

The Ultrium Tape Drives write data to and read data from IBM LTO Ultrium Data Cartridges. The drives communicate with the server by using one of three types of attachment interfaces: Fibre Channel, LVD SCSI, or HVD SCSI. Library SCSI commands and SCSI status pass to and from a server through LUN 1 of the first drive of any logical library.

Figure 15 shows the Ultrium Tape Drive inside the UltraScalable Tape Library.

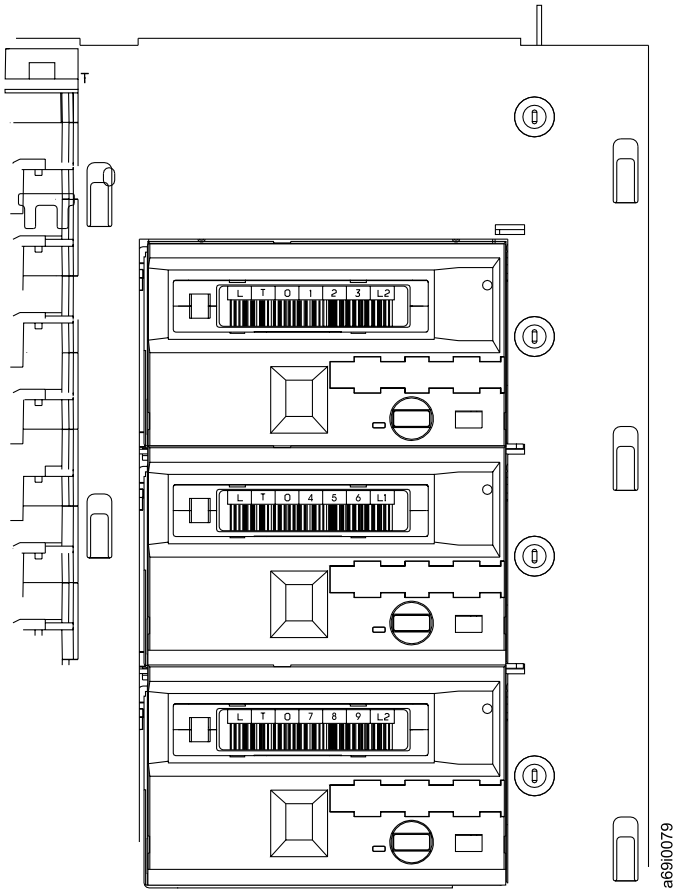

Figure 15. Ultrium Tape Drives. Three drives are shown inside the library and are loaded with LTO Ultrium Tape Cartridges.

DLT Tape Drive and Control Port

The DLT Tape System writes data to and reads data from DLTtape IV Tape Cartridges. The drive communicates with the library and the server through one of two types of attachment interfaces: Fast/Wide LVD SCSI or HVD SCSI.

Unlike the Ultrium Tape Drives, the DLT 8000 Tape Systems in a Model D42 frame require a hardware unit called a control port. Library SCSI commands and SCSI status pass to and from the server through LUN 0 of the control port. The control port is available with an HVD or LVD SCSI interface, but not a Fibre Channel interface. A control port provides one control path to a logical library. One control port is standard in row 0. You can order up to six additional control ports per frame and place them in any of rows 1 through 12, however each LVD or HVD control port must be positioned above a like-kind LVD or HVD DLT 8000 Tape System. Each additional control port reduces the quantity of drives available in the compartment by one.

Figure 16 shows the DLT 8000 Tape System inside the UltraScalable Tape Library.

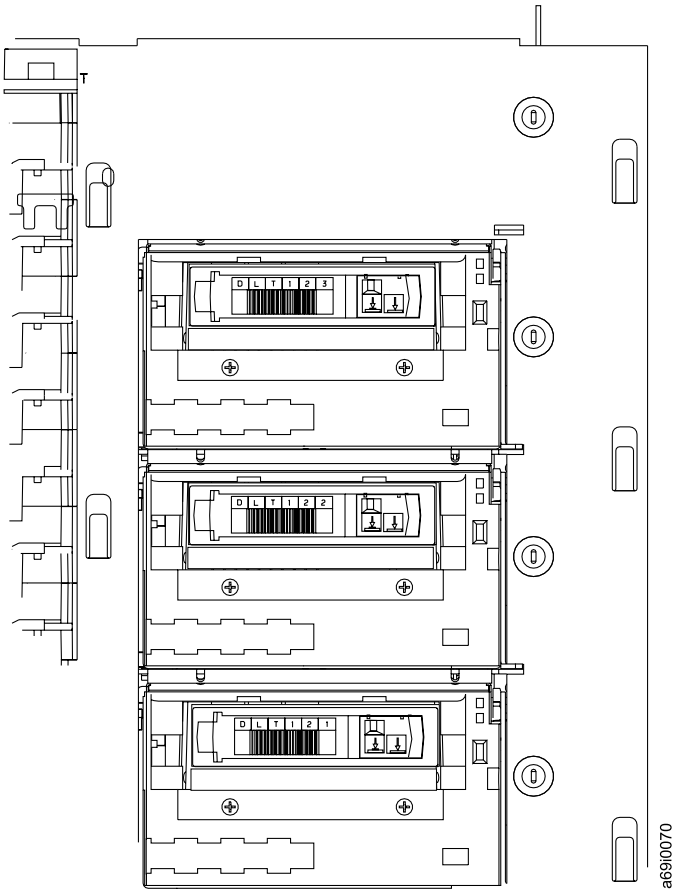

Figure 16. DLT 8000 Tape System. Three drives are shown inside the library and are loaded with DLTtape IV Tape Cartridges.

Physical Address

The UltraScalable Tape Library assigns each tape drive or control port a unique address to indicate its physical location. You can then use the address whenever you initiate an operation, such as moving a tape cartridge or performing manual cleaning. The drive or control port address consists of two values: a frame number and a row number. The values are defined as follows:

Frame number

Represented as `Fx`, where `F` equals the frame and `x` equals its number. Regardless of whether any drives or control ports are installed, the frame number for the base frame is 1 and increments by one for each adjacent expansion frame.

Row number

Represented as `Rzz`, where `R` equals the row and `zz` equals its number. For the top position in the column, the row number is 0. This position is only accessible from the rear door and only available for a control port. Rows 1 through 12 are available for drives or control ports. Regardless of whether drives or control ports are installed, the row numbering is the same for every frame.

Thus, a drive or control port address of F02,R10 means frame 2 (the first expansion frame), row 10.

Logical Address

Like a physical address, the UltraScalable Tape Library also assigns each tape drive a SCSI element address that consists of a value that defines a logical location in the library to the SCSI interface. This logical address is represented on the operator panel as `xxxx(yyyh)`, where `xxxx` is a decimal value and `yyyh` is a hexadecimal value. It is assigned and used by the application when the server processes SCSI commands. The SCSI element address for a drive is unique to the drive's location; it does not vary based on other drives in the library. Appendix D, "Locations and Addresses of SCSI Elements", on page 271 lists the SCSI element addresses for storage slots, I/O slots, and drives.

Doors

Located at the front of each frame is the front door (see Figure 13 on page 43). The door lets you access the cartridge storage slots that are mounted on the door wall and frame wall (service personnel use the door to access the rail assembly, cartridge accessor, and accessor controller).

The operator panel (**1** in Figure 17) is mounted on the front door of the base frame (Model L32). Also located on the base frame's door are the power switch **2** and up to two input/output (I/O) stations **3** and **4** . A door handle **5** and a keylock (with key) **6** are included on the front door of all frames (the keys to all front doors are interchangeable). To unlock and open the door of any frame, insert the key into the keylock and turn it counterclockwise approximately 180°.

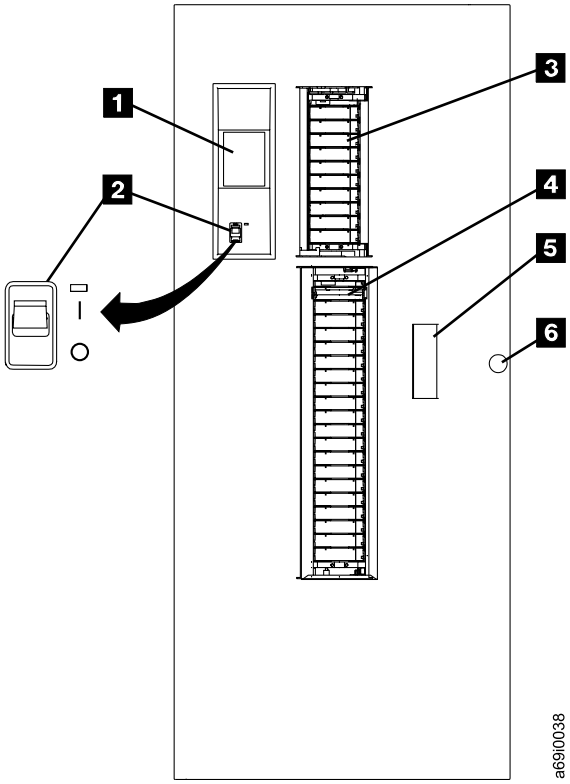

Figure 17. Front door. The operator panel is mounted on the front door of the base frame (Model L32). The doors of both I/O stations are in an opened position.

Each frame of the UltraScalable Tape Library also includes a rear door with a keylock and key (the keys to all rear doors are interchangeable). To unlock the rear door of any frame, insert the key into the keylock and turn it clockwise.

The keys to the front and rear doors are not interchangeable.

If you open the front door of any frame during an operation, the UltraScalable Tape Library fails the active operation and rejects new requests for operations until all doors are closed. After approximately 15 seconds, the library performs an inventory update for frames whose doors have been opened (a process that determines whether cartridges have been added to or removed from the library, or moved within the library). Following the inventory, the library accepts new requests for operations.

Door Safety Switch

Each library frame includes a door safety switch (**5** in Figure 13 on page 43) that automatically turns off the power to the cartridge accessor (but not the tape drive) whenever you open the front door (the power does not automatically turn off if you open the rear door). After you close the front door, the UltraScalable Tape Library automatically performs an inventory of the tape cartridges.

I/O Stations

Note: Place only LTO Ultrium tape cartridges into Ultrium frames with black, Ultrium-supported I/O slots; place only DLT tape cartridges into DLT frames with gray, DLT-supported I/O slots. For information about loading and unloading cartridges to and from the I/O stations, see “Using the I/O Stations to Insert Cartridges” on page 71 and “Removing Data Cartridges from the Library” on page 75.

The I/O stations (**6** in Figure 13 on page 43) let you insert or remove cartridges while the UltraScalable Tape Library is performing other operations.

The library comes with one 10-cartridge LTO I/O station. To add greater capacity:

- In a library that supports only LTO Ultrium tape cartridges, you can order a second, 20-cartridge LTO I/O station.
- In a library that supports both LTO Ultrium and DLT tape cartridges, you automatically receive a second 18-cartridge DLT I/O station.

The 10-cartridge station is called the upper I/O station, and the 18- or 20-cartridge station is called the lower I/O station.

To open the door of an upper I/O station, grasp its handle at the bottom right and slide the door to the left. To open the door of a lower I/O station, grasp its handle at the top right and slide the door to the left. When an I/O station door is open, you can access its I/O storage slots. When the door is closed, the cartridge accessor can access the slots. Each I/O station has sensors and a locking mechanism to prevent you and the cartridge accessor from simultaneously accessing it.

If an I/O station door will not close, verify that the orientation of the cartridges is correct (see Figure 27 on page 71). Ensure that you are not inserting an LTO cartridge into a DLT I/O slot, or a DLT cartridge into an LTO I/O slot.

Each I/O station slot has a unique address to indicate its physical location. The I/O station slot address consists of two values: a frame number and a row number:

Frame number
: Represented as `Fx`, where `F` equals the frame and `x` equals its number. The frame number is always 1.

Row number
: Represented as `Rzz`, where `R` equals the row and `zz` equals its number. The row number is 1 for the top storage slot position in the I/O station and increments by one for each row below the top slot.

A library with two I/O stations assigns its I/O slot addresses as if the two stations were one. For example, an I/O slot address of F01,R05 means frame 1, row 5 (fifth row from the top of the upper I/O station; see 1 in Figure 18). An I/O slot address of F01,R13 means frame 1, row 13 (third row 2 in the lower I/O station).

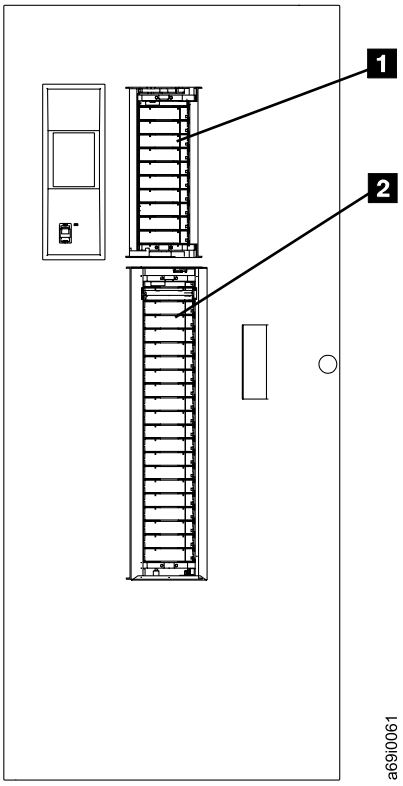

Figure 18. Storage slot addresses in the I/O stations

I/O storage slots vary in color. LTO I/O slots are black; DLT I/O slots are gray.

Operator Panel

The operator panel (**7** in Figure 13 on page 43) is located on the front door of the base frame (Model L32). The panel provides an indicator light and controls that let you perform operations and determine the status of the library. It consists of the following components (see Figure 19):

1 Library power switch
A toggle switch that lets you power the UltraScalable Tape Library on and off. To power the library on, move the power switch to |; to power the library off, see “Powering-Off the Library” on page 69.

2 Power-on indicator
A green light that, when lit, indicates that dc power is available within the library.

3 Touchscreen LCD
A liquid crystal display (LCD) that, when touched on the touch keys, shows the library’s status and menus. Use the display to perform basic and advanced operations (service personnel use the display to run diagnostic tests and observe results). The LCD displays 12 to 15 lines of characters.

4 Touch keys
An array of small, touch-sensitive keypads that lets you select and navigate through menus. For most menus, the keypads are defined as BACK, UP, DOWN, and ENTER. To acknowledge that it has been pressed, a touch key initiates an audible beep when you press it. To disable the keypress beep, see “Enabling or Disabling the Keypress Beep” on page 175.

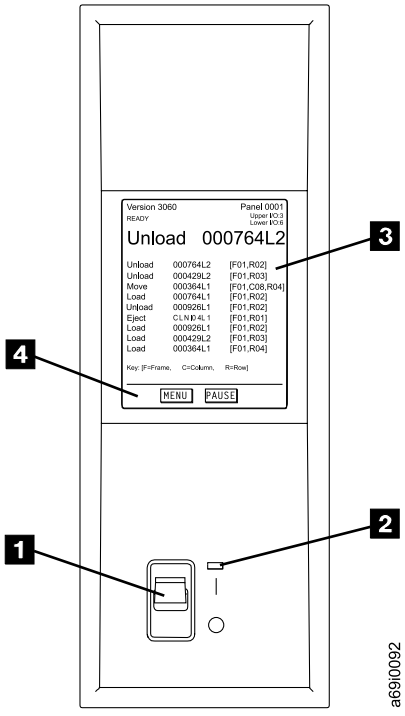

Figure 19. Sample screen on the operator panel of the IBM TotalStorage UltraScalable Tape Library 3584

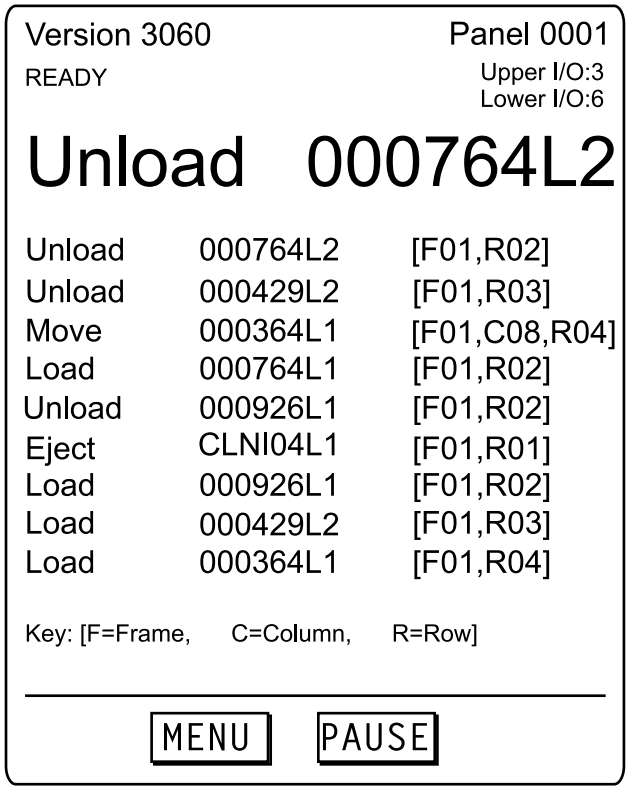

Figure 20. Sample Activity screen on the IBM TotalStorage UltraScalable Tape Library 3584

Activity Screen

The Activity screen (see Figure 20) displays on the touchscreen LCD when the library is ready (that is, when the host applications may interact with the library). The first line on the screen shows the current level of library firmware and the panel (screen) number. The left field on the second line indicates whether the library is ready, not ready (not interacting with host applications), or initializing. The right field indicates the status of one or more I/O stations.

The text in the I/O field varies, depending on whether the library has one or two I/O stations:

- If the library contains only one I/O station, `I/O:` displays.
- If the library contains two I/O stations, `Upper I/O:` and `Lower I/O:` display.

The values that can appear in the I/O field are:

- `OPEN` (when the door of an I/O station is open)
- `LOCKED` (when the door of an I/O station is closed and locked, and when the library is accessing or scanning cartridges)
- `xx` (where `xx` equals the quantity of tape cartridges in an I/O station)

The Activity screen also shows the current activity in a large font type and provides a history of preceding operations in a smaller font type. The operations are listed from top to bottom, with the most recent at the top and the oldest at the bottom. The first line of smaller font type gives a detailed description of the current activity (for example, in the sample Activity screen shown in Figure 20, a cartridge with a

volume serial number (VOLSER) of 000764L2 was unloaded from the drive in frame 1, row 2). The last character of an LTO VOLSER can be 1 or 2, and indicates the generation of the media.

The information in the Activity screen is automatically replaced by an error message when the UltraScalable Tape Library detects the following conditions:

- A permanent error has occurred.
- A drive requires cleaning and one of the following conditions exists:
  - Automatic cleaning has been disabled.
  - No cleaning cartridge is present in the library.
  - The cleaning cartridge has expired.

Most screens that are left unattended for more than 5 minutes automatically default to the Activity screen.

PAUSE Key

The UltraScalable Tape Library features a PAUSE touch key that you should press before you power off the library or open the front door. Located on the Activity screen on the display, the PAUSE key causes the cartridge accessor to park itself (to quickly resume operation later) and give you clear access to the library's interior should you need to open the front door.

If you press the PAUSE key by mistake, wait until the end of the 30-second timeout. The library will automatically resume the operation.

Attention: After you open the front door, the library rejects requests for new operations until you close the door and the inventory is completed.

Chapter 4. Operating Procedures

You can operate the IBM TotalStorage UltraScalable Tape Library 3584 from its operator panel or by using the UltraScalable Specialist Web Interface. This chapter includes the operating procedures that you can perform and gives an overview of the TotalStorage Specialist web interface.

Not all operating procedures are available from the library's operator panel or web interface. For an overview of the operator panel functions, see "Functions of the Library's Operator Panel" on page 62. For an overview of the web functions, see "Functions of the Library's UltraScalable Specialist Web Interface" on page 63.

If your library uses both LTO and DLT media, certain screens on the operator panel may display a `Media Type` field. This field confirms the type of media that you chose for a particular operation.

Note: This book addresses the level of firmware that was available at the time of publication. If you update your firmware to the latest level, the look and functionality of the interface may be different from what is shown in this book.

Table 15. Operating procedures for the IBM TotalStorage UltraScalable Tape Library 3584

If You Want To View This...	Go To Page...
Community name	160
Control paths	146
Configuration of the library	116
Destination IP addresses	154
Ethernet settings	162
Location of any cartridge	104
Loop ID (AL_PA) of a tape drive or control port	137
Remote port	158
SCSI ID of a tape drive or control port	137
Status of the cartridge accessor	94
Status of a control port	98
Status of the I/O stations	100
Status of any storage slot	102
Status of a tape drive	96
Usage of the cartridge accessor	178
Usage of the cleaning cartridge	182
Usage of the tape drives	180
Users with active web interface sessions	93
Version of an SNMP trap	152
Vital product data (VPD) for the control ports	190
VPD for the library	184
VPD for the node cards	188
VPD for the Ultrium Tape Drives	186

Table 15. Operating procedures for the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

	World Wide Node Name of a Fibre Channel tape drive	144
	World Wide Port Name of a Fibre Channel tape drive	142
	If You Want To Change This...	**Go To Page...**
	A user's settings	91
	Automatic cleaning of a tape drive	78
	Community name	160
	Control paths	148
	Date and time on the LCD	173
	Destination IP address	154
	Ethernet address settings	165
	Ethernet connection (disable)	171
	Insert notification	71, 176
	Keypress beep	175
	Location of cartridges in a logical library by using the I/O station	71, 176
	Loop ID (AL_PA) of a tape drive or control port	139
	Number of partitions in the library by using labels	123
	Number of partitions in the library by using menus	132
	Number of partitions in the library without partitions	119
	Number of web users	90
	Password protection (activate or deactivate)	89
	Remote port	158
	SCSI ID of a tape drive or control port	139
	SNMP settings	150
	Speed of the Ethernet cable	167
	Your password	92
	If You Want To Do This...	**Go To Page...**
	Activate or deactivate password protection	89
	Add a user	90
	Assign cartridges in an I/O station to a logical library	71, 176
	Configure the library with partitions (by using labels)	123
	Configure the library with partitions (by using menus)	132
	Configure the library without partitions	119
	Cycle power to a drive from a remote location (web only)	196
	Disable Ethernet	171
	Download library logs	192
	Download drive logs	192
	Download control port logs	192
	Enable or disable automatic cleaning of a tape drive	78
	Enable or disable SNMP	150
	Initialize the tape cartridge's volume serial number	88
	Insert a cleaning cartridge into the library	80

Table 15. Operating procedures for the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Insert a data or scratch cartridge into the library	70
Manually clean a tape drive	84
Modify a user's settings	91
Move a specific tape cartridge	110
Perform an inventory of a frame	108
Perform an inventory of the library	106
Remove a cartridge from the library	75
Remove a user	91
Search for a cartridge by its VOLSER	104
Send a test SNMP trap	156
Turn off the power to the library	69
Turn on the power to the library	68
Update drive firmware (web only)	194
Update library firmware (web only)	193
Update control port firmware (web only)	195
Use DHCP server settings	169

Functions of the Library's Operator Panel

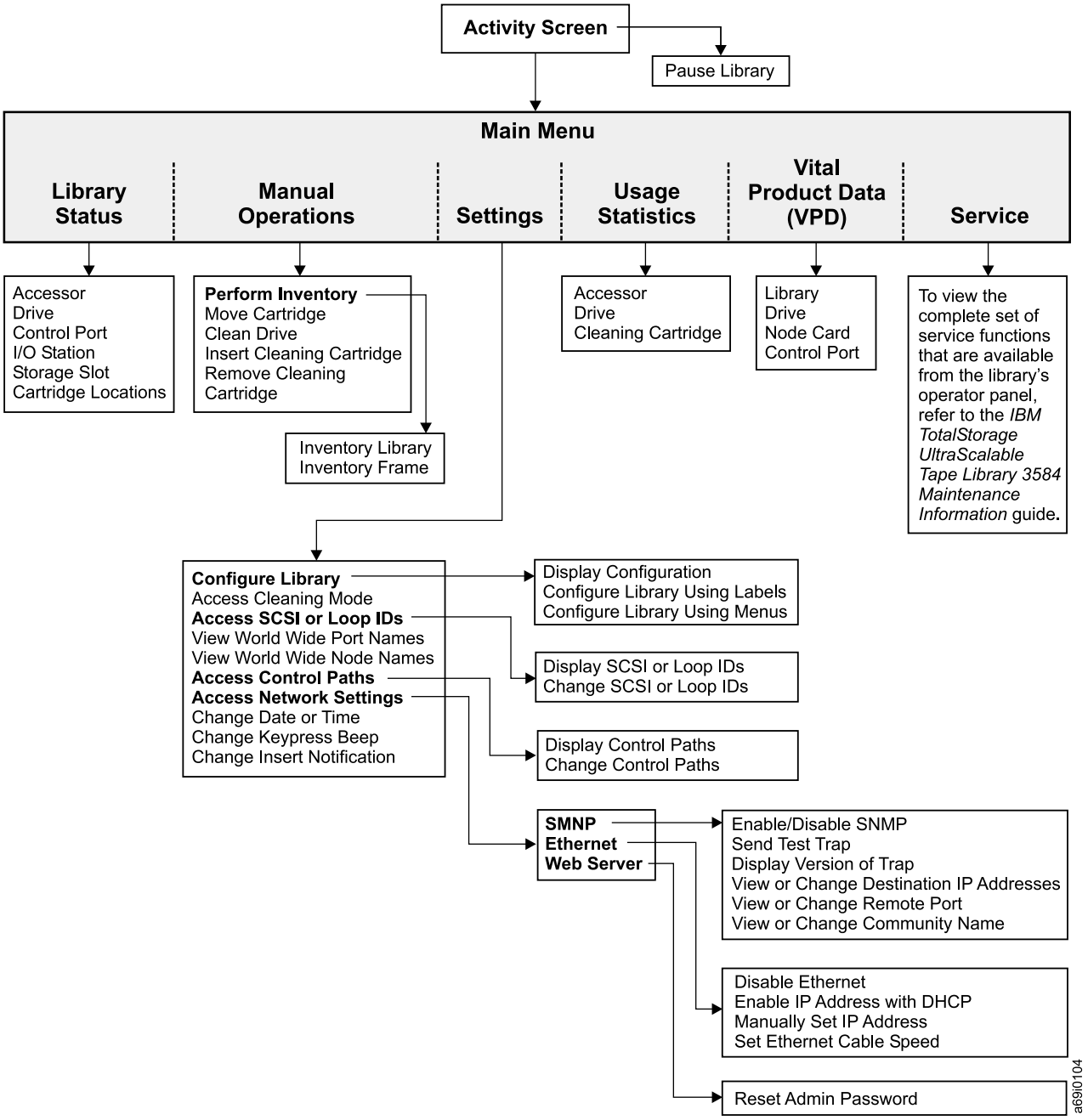

Figure 21. Functions of the library's operator panel. Items in boldface font mean that subfunctions are available.

Functions of the Library's UltraScalable Specialist Web Interface

The UltraScalable Specialist interface lets you perform many library functions from the web. Figure 22 shows a flowchart of the functions that are available depending on your library's configuration.

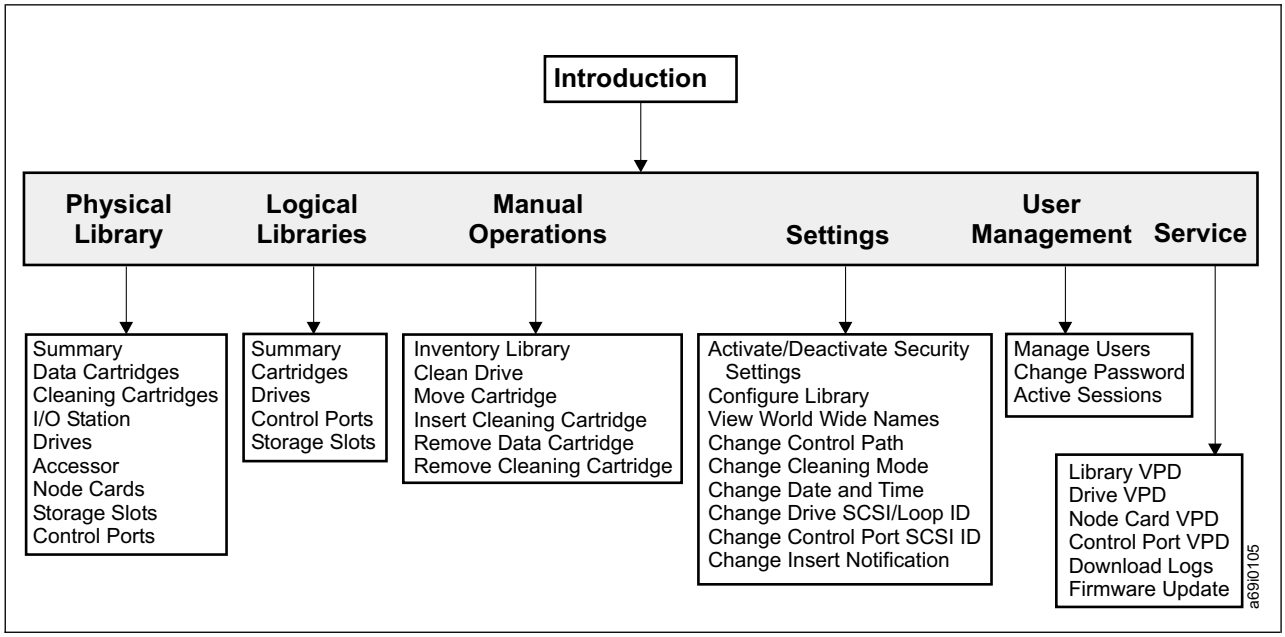

Figure 22. Functions of the library's UltraScalable Specialist web interface

Operating the Library from the Web

If you choose to operate the UltraScalable Tape Library by using a web browser rather than the library's operator panel, read this section. The library features the UltraScalable Specialist web interface. To use the interface, perform the following steps:

1. Make sure that you have available the Ethernet Internet protocol (IP) address of the frame to which you want to connect (for example, `http://10.1.1.1`). To determine the Ethernet IP address, see "Viewing Ethernet Settings" on page 162.
2. Access Internet Explorer 5.0 (or higher) or Netscape Navigator 6.0 (or higher).
3. Type the Ethernet IP address on the URL line of the browser and press Enter.

The Home screen of the UltraScalable Specialist web interface displays (see Figure 23). The screen lets you access library functions.

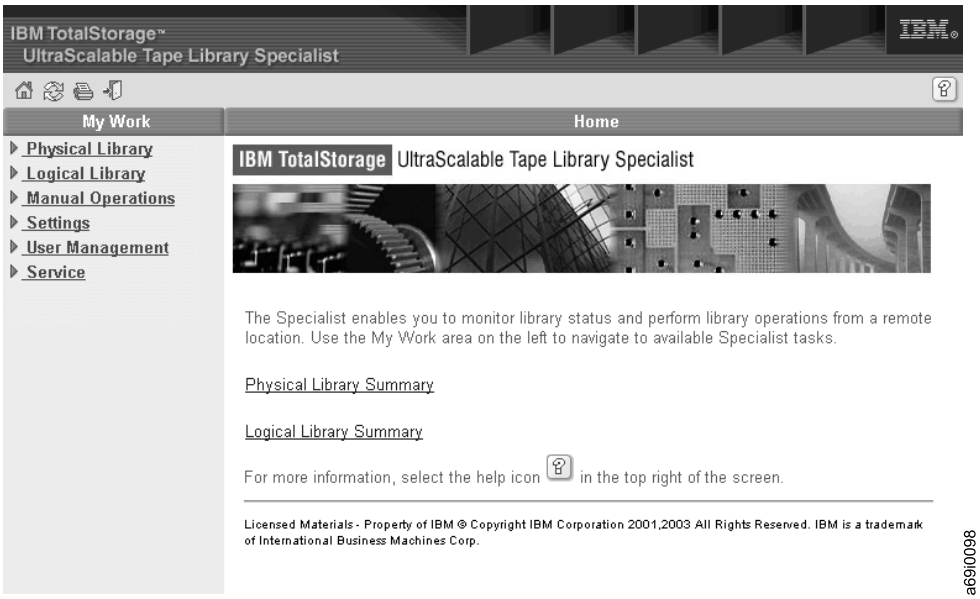

Figure 23. Sample Home screen of the UltraScalable Specialist web interface (your screen may vary slightly)

Navigating Through the UltraScalable Specialist Web Interface

Navigation through the UltraScalable Specialist interface is easy. Figure 24 shows the elements and navigational aids in a typical screen.

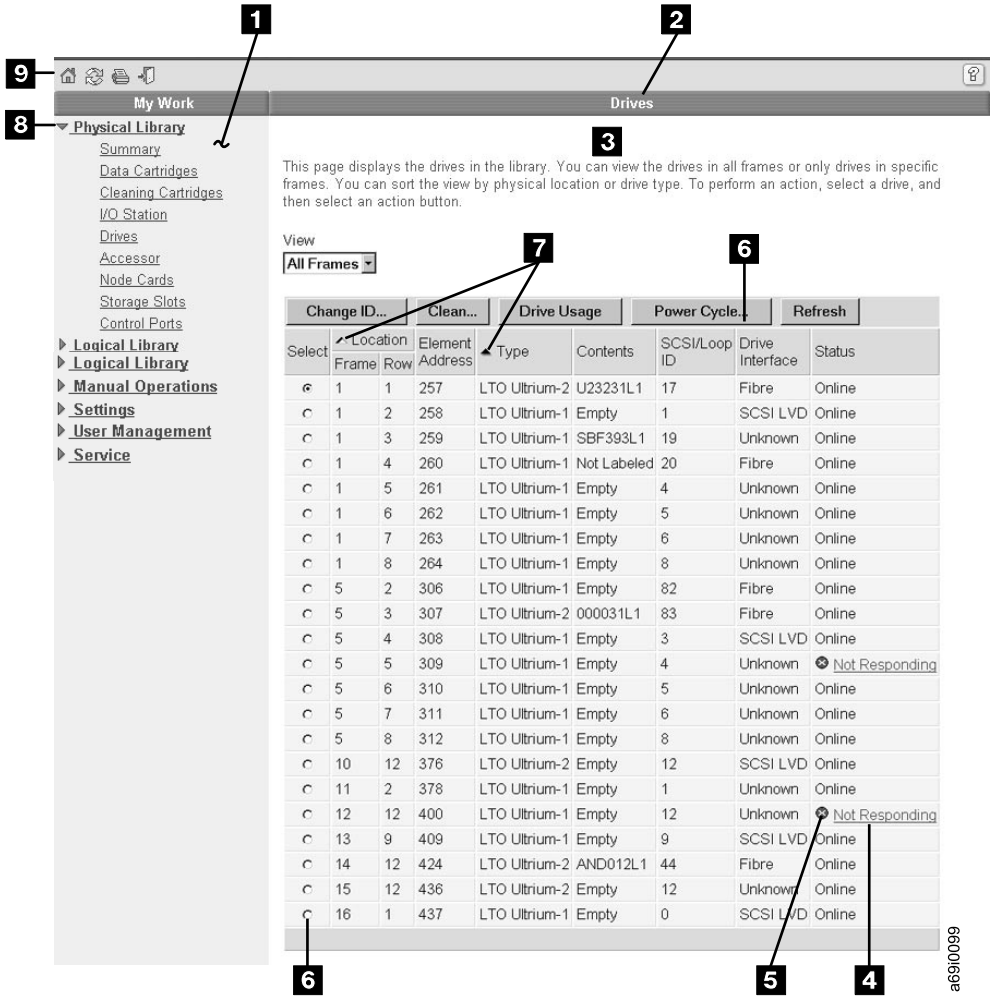

Figure 24. Elements in a typical UltraScalable Specialist web screen

1 Navigation area

A selection of functions that you can perform. When you select a function, sub-functions display. Select the sub-functions to go to related menus.

2 Screen title

A navigational tool to help you track your location in the application.

3 Content area

A collection of information that lends meaning to a query or a function, such as the number of the frame or row, an element address, the type of drive (Ultrium 1, Ultrium 2, or DLT), an indication of whether a drive is occupied or empty, a drive's interface and its SCSI or Loop ID.

4 Link

Represented as underscored text, a link is an electronic path that leads to another page. For example, if a problem exists, select `Offline` to go to another page that describes the problem and gives possible actions.

5 Error indicators

Icons that indicate a problem. Select the hyperlinked text to the right of the icon to display an error or informational message. The icons include:

A yellow triangle with a black exclamation point indicates a problem of low to medium severity. Action is required, but the problem is not urgent.

A red circle with a white X indicates a problem of severe to fatal severity. Immediate action is required or the function cannot continue.

6 Buttons

Screen entities that indicate selection. Radio buttons (round buttons) signify objects; select buttons (rectangular buttons) signify actions. For example, if you want to view how many cartridges have been loaded and unloaded into the drive at Frame 1, Row 7, select the round button beside that drive, then select the rectangular Drive Usage button to begin the procedure. You cannot select multiple radio buttons.

7 Sort indicators

A filled triangle indicates that the field can be sorted. An empty triangle indicates that the field has been sorted.

8 Twisty

A triangular icon at the left of each function in the navigation area or in other fields. You can select the twisty or the function to display a list of sub-functions. Select the twisty again to collapse the list.

9 Menu bar icons

Icons that perform the following functions:

Return to the Home Screen.

Refreshes the content area.

Prints the content area.

Goes to the Help topics. Help is context-sensitive and includes screen overviews and troubleshooting tips. After you select the Help icon, select the icons at the bottom left of the screen to access a table of contents and an index.

Logs you out of the currently active session.

Using the UltraScalable Specialist Interface

After you connect to the UltraScalable Specialist web interface and display the Introduction screen, select Physical Library. The Physical Library Summary screen displays the library's main components and physical configuration (see Figure 25). To get information about each main component, perform one of the following:

- Select the component in the navigation area
- Select the graphical frame, then the component
- Select the frame from the View drop-down box, then select the component

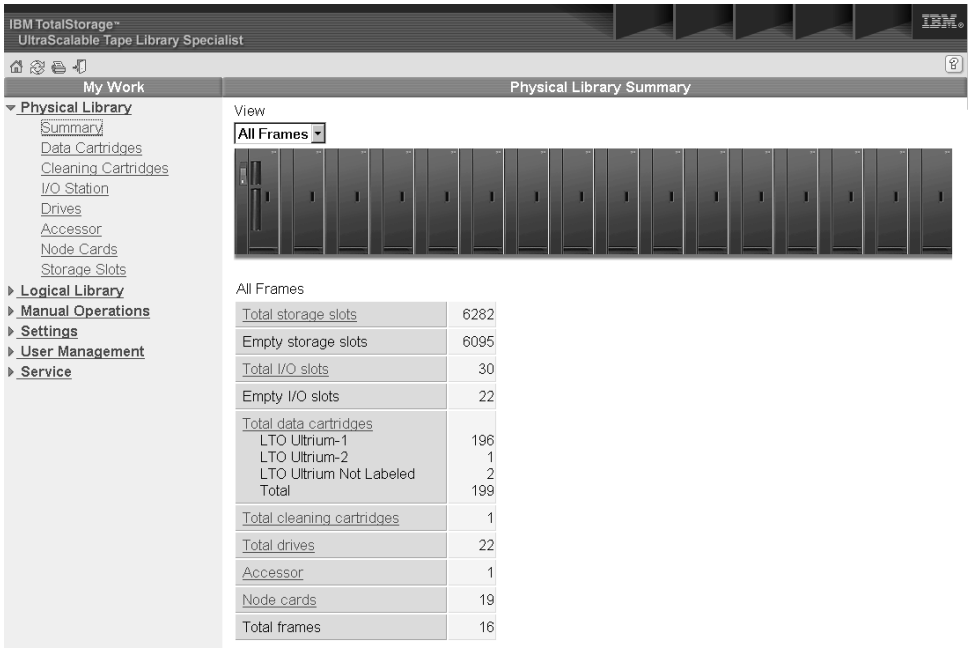

Figure 25. Physical Library Summary screen

Powering-On the Library

Use the following steps to power-on the UltraScalable Tape Library:

1. Review the information about the library power switch and power-on indicator in “Operator Panel” on page 55.
2. While watching for the green power-on indicator to turn on and stay on (see **1** in Figure 26), move the library power switch (see **2**) to |. When you move the switch, the base library and the expansion frame (if attached) power-on at the same time. If the green power-on indicator fails to light, call your IBM Service Representative.

When you power-on the library, it executes a power-on initialization sequence for about 2 minutes. During that time, the menus on the touchscreen display are not available for use. After the power-on initialization sequence, the library performs an inventory of the tape cartridges, which takes less than 60 seconds per frame. The sequence is complete and the library is available for use when the message **READY** displays on the Activity screen.

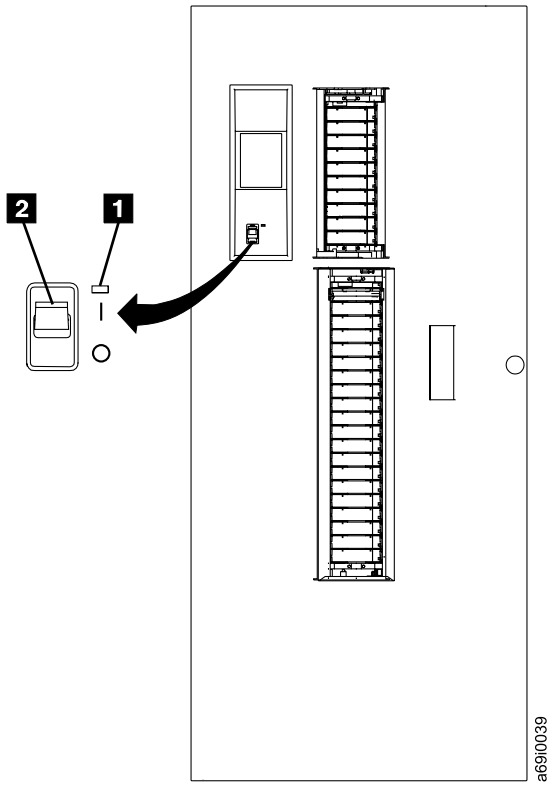

Figure 26. Powering-on the UltraScalable Tape Library. The library power switch and the power-on indicator are located on the operator panel of the base frame (Model L32).

Powering-Off the Library

Note: Always press the PAUSE key before you power-off. If you power-off before pausing, the library may take longer to go online.

Use the following steps to power-off the UltraScalable Tape Library after normal operation and not during an emergency:

1. Ensure that the host application has removed cartridges from all drives and that the library is varied offline from the host (if the host is attached).
2. Press the PAUSE key on the display. The library displays the message **If you open the door the library will go offline and any remaining jobs in the work queue may fail. Press ENTER to continue.**
3. Press ENTER. The message **PAUSE in Progress** displays. The library parks the cartridge accessor in the base frame and displays the message **The library is now paused. Normal operations will resume in 30 seconds.**
4. Move the library power switch to 0 (see **1** in Figure 26 on page 68). If you do not power-off within 30 seconds, the Activity screen displays again.

Inserting Cartridges into the Library

After you install the UltraScalable Tape Library, you can insert cartridges into it. The following types of cartridges can be inserted:

Data or scratch cartridge
A tape cartridge that is designed to receive information recorded to it by a tape drive. A scratch cartridge is a data cartridge whose tape no longer contains useful information and which can be overwritten. To ensure that your tape library conforms to IBM's specifications for reliability, use only the IBM LTO Ultrium Data Cartridge in Ultrium Tape Drives and the IBM DLTtape IV Data Cartridge in DLT Tape Systems. You can use other LTO- or DLT-certified media, but they may not meet the standards of reliability established by IBM. If you are using mixed drive types, place LTO Ultrium Tape Cartridges into Ultrium frames with black, Ultrium-supported I/O slots; similarly, place only DLT Tape Cartridges into DLT frames with gray, DLT-supported I/O slots.

Cleaning cartridge
A tape cartridge that is used by the library to clean the heads of its tape drives. Use only the IBM LTO Ultrium Cleaning Cartridge or an IBM-approved cleaning cartridge to clean an Ultrium Tape Drive. Use only the IBM DLT Cleaning Cartridge or an IBM-approved cleaning cartridge to clean a DLT Tape System. The procedure for inserting and removing cleaning cartridges is different than the procedure for inserting and removing data and scratch cartridges. For more information, see "Inserting a Cleaning Cartridge into the Library" on page 80 and "Removing a Cleaning Cartridge from the Library" on page 86.

Diagnostic cartridge
A tape cartridge that is used by the IBM Service Representative to service the UltraScalable Tape Library. The service representative installs the cartridge at the same time that the library is installed. For libraries that use Ultrium and DLT tape drives, the service representative installs a diagnostic cartridge for each type of drive.

The quantity of cartridges that you can add to the UltraScalable Tape Library is equal to the maximum number of available storage slots (see Appendix A, "Frame Capacity", on page 255). Before you insert data or scratch cartridges, make sure that there are enough available slots (see "Storage Slot Status" on page 102).

Conditions apply to mixing drives and media. For more information, see "Mixing Drive Types in Frames" on page 11.

There are two ways to insert data and scratch cartridges:

- Insert the cartridges into an I/O station and let the host application software move the cartridges into the library.
- Open the front door of a frame and bulk load the cartridges directly into empty storage slots (if you use mixed drive types, place LTO Ultrium Tape Cartridges into black slots and DLT Tape Cartridges into gray slots). Because this method takes the UltraScalable Tape Library out of operation, use it only to add or remove large quantities of tape cartridges.

The sections that follow describe each method of inserting data and scratch cartridges.

Using the I/O Stations to Insert Cartridges

Use the following steps to insert the cartridges into the I/O stations and move them into the UltraScalable Tape Library:

1. On the library's Activity screen, look at the right field on the second line and determine whether the I/O station that you want to use is locked. If the field reads `I/O: LOCKED`, use your application software to unlock the I/O station.
2. Open the door of the intended I/O station and perform the following (see Figure 27):
   - For LTO Ultrium I/O slots (black), insert an LTO Ultrium Tape Cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the right.
   - For DLT I/O slots (gray), insert a DLTtape IV Tape Cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the left.

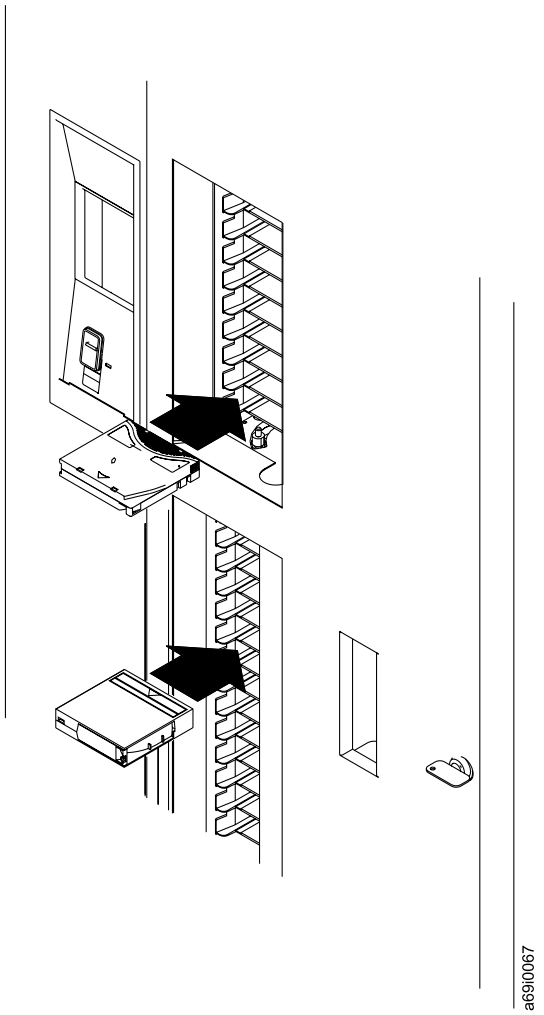

Figure 27. Using an I/O station to insert cartridges. Ensure that the arrow on the cartridge points to you, then slide it into the storage slot. After you insert the cartridges, use the host application software to move the cartridges to the library's storage slots or drives. The figure shows a library that uses Ultrium and DLT tape drives.

One of the following actions occurs:

- If the Insert Notification setting is enabled (see “Enabling or Disabling Insert Notification” on page 176), the Insert Notification screen prompts you for a logical library to assign the cartridges to. Press UP or DOWN to select the logical library that you want for that cartridge and press ENTER.
- If the Insert Notification setting is disabled, the cartridge is made available to any logical library until the cartridge is moved to a storage slot by a host or by the user interface.

Note: In a library that is not partitioned into logical libraries, the Insert Notification screen does not display and the cartridge will be automatically assigned to the first logical library of its media type.

```
Please select a logical          Panel 0191
library to assign the
new cartridges to.

Logical Library:  1

30 seconds until
automatic return to the
Activity Panel

[BACK]  [ UP ]        [ENTER]
```

3. Close the door of the I/O station. If the door will not close, check the type and orientation of the tape cartridge that you are using. Ensure that you are not inserting an LTO cartridge into a DLT I/O slot, or a DLT cartridge into an LTO I/O slot. If necessary, repeat step 2 on page 71.
4. Use your host’s application software to move the cartridges into the library. (To move the cartridges, refer to your application software’s documentation.)

   Note: SCSI Medium Changer libraries do not automatically move cartridges into the library.
5. To manually move the cartridges from the I/O station to the library’s storage slots or drives, refer to “Moving a Cartridge” on page 110.

Bulk Loading Cartridges into Empty Storage Slots

Use the following steps to bulk load (manually insert) cartridges directly into the library's storage slots:

1. If you previously used the Advanced Configuration option to partition storage slots into logical libraries (rather than use labels to mark the partitions), determine the boundaries of those partitions by using the Display Configuration option (see "Displaying the Existing Configuration" on page 116). Make a note of the boundaries so that you do not place a cartridge outside of a boundary.
2. From the library's Activity screen (see Figure 28), press the PAUSE key. The library displays the message **If you open the door the library will go offline and any remaining jobs in the work queue may fail. Press ENTER to continue.**

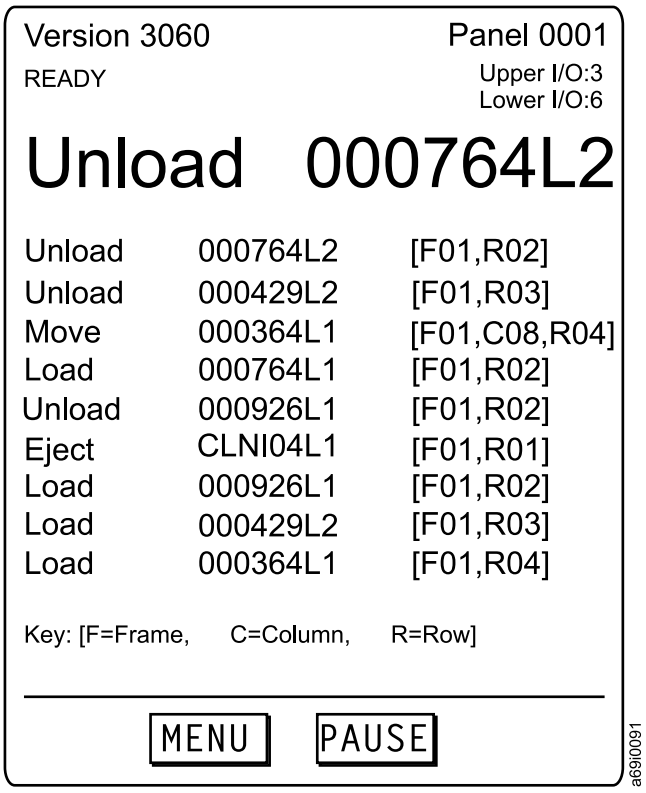

Figure 28. Activity screen on the front panel of the IBM TotalStorage UltraScalable Tape Library 3584. Use the screen to bulk load tape cartridges.

3. Press ENTER. The message **PAUSE in Progress** displays. The library parks the cartridge accessor in the base frame and displays the message **The library is now paused. Normal operations will resume in 30 seconds.**
4. Within 30 seconds, unlock and open the front door on any frame. If you do not open the door within 30 seconds, the Activity screen redisplays.

Note: In the following step, place only Ultrium tape cartridges into black Ultrium cartridge storage slots; place only DLT tape cartridges into gray DLT cartridge storage slots.

5. Insert the cartridges into any empty storage slots, except the slots for the diagnostic cartridges (that is, F01,C01,R01 for LTO Ultrium Tape Cartridges; or, if you are using mixed drive types, Fx,C01,R01 and Fx,C01,R02 for DLT Tape Cartridges, where x equals the first expansion frame for the second type of media). If you previously partitioned logical libraries with labels (see "Configuring the Library by Using Labels" on page 123), insert the cartridges into the appropriate logical library.

CAUTION:
Only place cartridges in a frame whose front door is open. Do not add or remove cartridges from an adjacent frame.

- Insert Ultrium cartridges into the storage slots so that the write-protect switch is on the left and the VOLSER label is visible (see Figure 29).

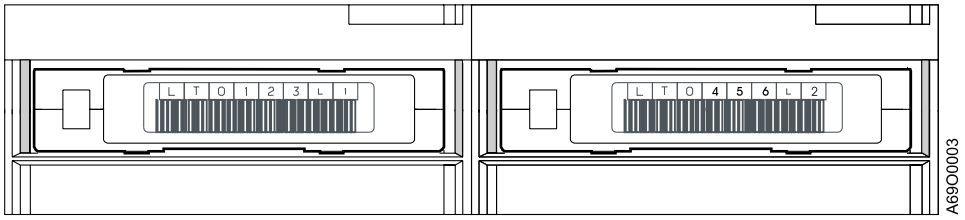

Figure 29. Proper orientation of the LTO Ultrium Tape Cartridge in a cartridge storage slot. The write-protect switch is on the left and the VOLSER label is visible. The orientation differs from the orientation in an I/O slot.

- Insert DLT cartridges into the storage slots so that the write-protect switch is on the right and the VOLSER label is visible (see Figure 30).

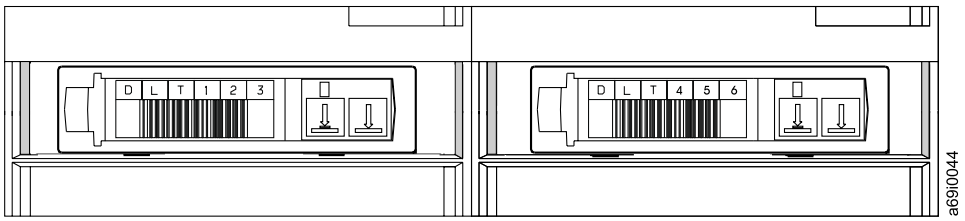

Figure 30. Proper orientation of the DLTtape IV Tape Cartridge in a cartridge storage slot. The write-protect switch is on the right and the VOLSER label is visible. The orientation differs from the orientation in an I/O slot.

6. Gently close and lock the front door.
7. After approximately 15 seconds, the UltraScalable Tape Library automatically inventories the frame of the door that you opened. During the inventory, the message **INITIALIZING** displays on the Activity screen. When the inventory is complete, **READY** displays.

   Note: If you inserted cartridges into an adjacent frame, you must also cause the library to perform an inventory of that frame or perform an inventory of the entire library from the operator panel (see "Performing an Inventory of the Library" on page 106).

Removing Data Cartridges from the Library

To remove a data cartridge from the UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Remove Data Cartridge**. The Data Cartridges screen displays.
3. Follow the instructions on the screen to specify the data cartridge and remove it to the I/O station.
4. Look at the Activity screen to determine whether the I/O station that you want to use is locked or unlocked. If the station is locked, use your application software to unlock it.
5. Open the door of the I/O station and remove the cartridge.
6. Close the door of the I/O station.

From the Operator Panel

To use the library's operator panel, perform the following steps:

1. Perform one of the following:
   - Use your host's application software to move the cartridges to an I/O station.
   - Manually move the cartridges to an I/O station (see "Moving a Cartridge" on page 110).

     Each time that you move a cartridge from a storage slot to an I/O station, the library updates the display to show the quantity of cartridges in the station.
2. Look at the Activity screen to determine whether the I/O station that you want to use is locked or unlocked. If the station is locked, use your application software to unlock it.
3. Open the door of the I/O station and remove the cartridges.
4. Close the door of the I/O station.

Removing a Data Cartridge from a Drive

In a rare situation, you may want to remove a data cartridge directly from a drive (that is, without transferring it to an I/O station). To remove a cartridge directly from a drive, perform the following procedure:

1. From the library's Activity screen (see Figure 28 on page 73), press the PAUSE key. The library displays the message **If you open the door the library will go offline and any remaining jobs in the work queue may fail. Press ENTER to continue.**
2. Press ENTER. The message **PAUSE in Progress** displays. The library parks the cartridge accessor in the base frame and displays the message **The library is now paused. Normal operations will resume in 30 seconds.**
3. Within 30 seconds, unlock and open the front door on any frame. If you do not open the door within 30 seconds, the Activity screen redisplays and library operations resume.

CAUTION:
Only remove cartridges from a frame whose front door is open. Do not add or remove cartridges from an adjacent frame.

4. Locate the drive that contains the cartridge that you want to unload and perform the following procedure:
   - For the Ultrium Tape Drive, press the unload button (see **1** in Figure 31). Remove the cartridge.

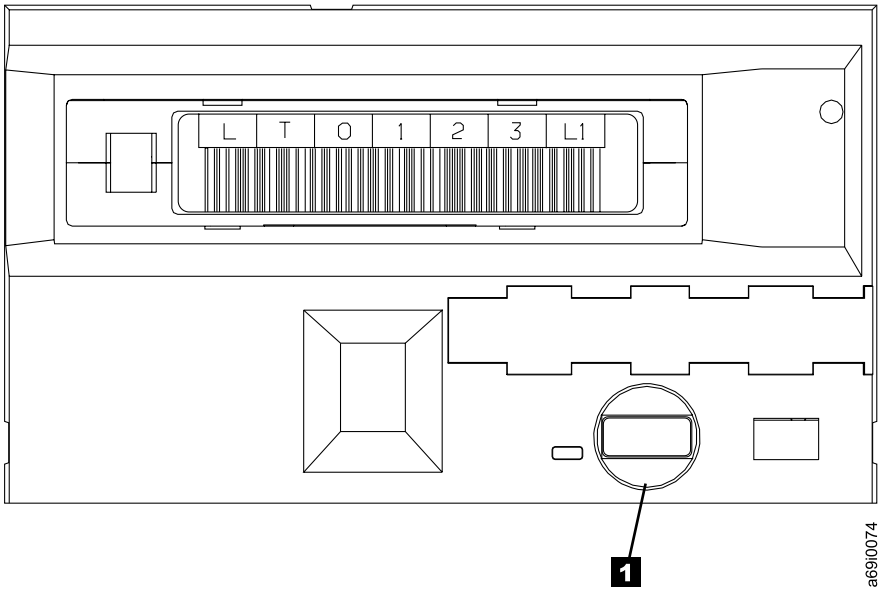

Figure 31. Removing a cartridge from an Ultrium Tape Drive

- For the DLT Tape System, perform one of the following procedures:
  - If the green Operate Handle light (see **1** in Figure 32) is on, the drive is ready to be unloaded. Place your hand in front of the load compartment and press the unload button **2** . Keep your hand in place for 3 to 5 seconds and let the cartridge eject slowly so that the tape disengages properly from the threading mechanism. Remove the cartridge from the drive.
  - If the amber Tape in Use light **3** is on, the drive is in use. Press the unload button **2** . The drive rewinds the tape and unloads the cartridge. The green Operate Handle light comes on. Place your hand in front of the load compartment and press the unload button again. Keep your hand in place for 3 to 5 seconds and let the cartridge eject slowly so that the tape disengages properly from the threading mechanism. Remove the cartridge from the drive.

Attention: Do not leave the DLT cartridge protruding from the DLT drive or it will interfere with the operation of the gripper.

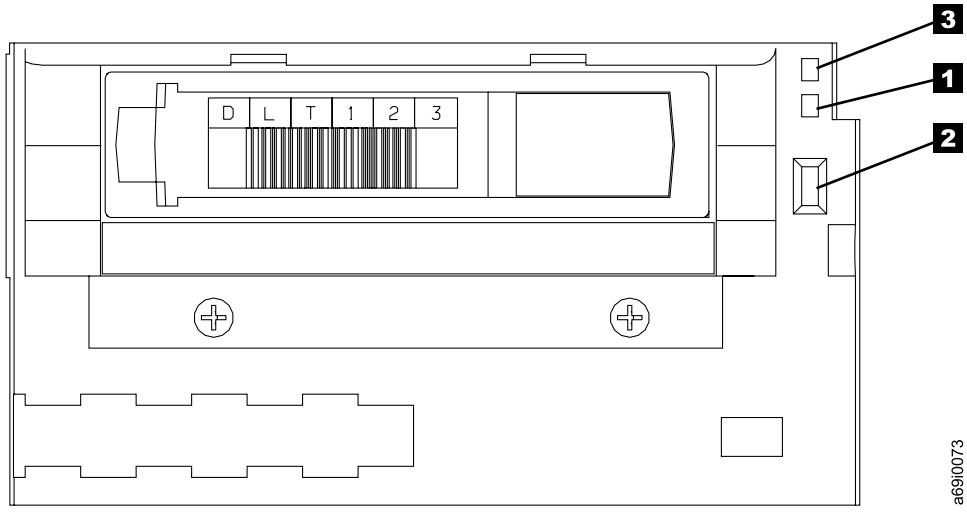

Figure 32. Removing a cartridge from a DLT Tape System

5. Gently close and lock the front door.
6. After approximately 15 seconds, the UltraScalable Tape Library automatically inventories the frame of the door that you opened. During the inventory, the message **INITIALIZING** displays on the Activity screen. When the inventory is complete, **READY** displays.

Enabling or Disabling Automatic Cleaning

Automatic cleaning enables the UltraScalable Tape Library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process without an operator's intervention. Automatic cleaning applies to all logical libraries that are configured for the UltraScalable Tape Library.

IBM recommends that automatic cleaning always be enabled for the UltraScalable Tape Library. When automatic cleaning is disabled, the library supports host cleaning (provided the host application software supports host cleaning).

If automatic cleaning is disabled, the library continues to detect the need to clean a tape drive. When the need is detected, the library displays the following message with the physical location of the drive (where `F` equals the frame and `x` equals its number, and where `R` equals the row and `zz` equals its number):

```
Clean Drive
[F0x,Rzz] - Auto Clean Disabled
```

The message clears after you clean the drive by using any supported cleaning method. For Ultrium Tape Cartridges, the cleaning cycle takes up to 2 minutes; for DLT Tape Cartridges, the cleaning cycles takes up to 6 minutes.

Whether you enable or disable automatic cleaning, the selected setting is stored in non-volatile memory and becomes the default during later power-on cycles.

To enable or disable automatic cleaning, use one of the following methods:

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Cleaning Mode**. The Cleaning Mode screen displays.
3. Follow the instructions on the screens to enable or disable automatic cleaning.

   Note: If you enable automatic cleaning, your cleaning cartridge can cross boundaries and clean multiple logical libraries. If you disable automatic cleaning, your cleaning cartridge cannot cross these boundaries. Therefore, if you disable automatic cleaning, make sure that you have at least one cleaning cartridge in every logical library.

From the Operator Panel

1. Ensure that a cleaning cartridge is loaded in the library (see "Inserting a Cleaning Cartridge into the Library" on page 80).
2. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Cleaning Mode, then press ENTER. The Cleaning Mode screen displays and indicates whether automatic cleaning is currently enabled or disabled.

```
Cleaning Mode          Panel 0110

Auto Clean is ENABLED

Disable Auto Clean

[BACK]    [ENTER]
```

5. Press ENTER (the ENTER key acts as a toggle switch for the two choices).
   - If you chose to enable automatic cleaning, the library displays the message **If you continue you will set the Automatic Cleaning Mode to ENABLED. Do you want to continue?**
   - If you chose to disable automatic cleaning, the library displays the message **If you continue you will set the Automatic Cleaning Mode to DISABLED. Ensure that each logical library has at least one cleaning cartridge. Host-initiated cleaning cannot use cleaning cartridges from another logical library. Do you want to continue?**
6. Press YES to enable or disable automatic cleaning. The Cleaning Mode screen redisplays with the new setting.
7. Press BACK until you return to the Activity screen.

Inserting a Cleaning Cartridge into the Library

To ensure that your tape library conforms to IBM's specifications for reliability, use only one of the following to clean the heads of the tape drives:

- For LTO Ultrium Tape Drives, use the IBM TotalStorage Cleaning Cartridge (part number 35L2086), the IBM LTO Ultrium Cleaning Cartridge (part number 08L9124), or an IBM-approved cleaning cartridge
- For DLT 8000 Tape System, use the IBM DLT Cleaning Cartridge (part number 59H3092) or an IBM-approved cleaning cartridge

The procedure for inserting a cleaning cartridge into the UltraScalable Tape Library varies, depending on whether automatic cleaning is enabled or disabled. The sections that follow describe each procedure.

Inserting a Cleaning Cartridge with Automatic Cleaning Enabled

To insert a cleaning cartridge into the UltraScalable Tape Library when automatic cleaning is enabled, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Open the door of the I/O station that you want to use and insert a cartridge as follows (see Figure 27 on page 71):
   - For LTO Ultrium I/O slots (black), insert an Ultrium tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the right.
   - For DLT I/O slots (gray), insert a DLT tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the left.
2. Repeat step 1 for each cartridge that you want to insert.
3. Close the door of the I/O station.
4. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
5. Select **Manual Operations —> Insert Cleaning Cartridge**. The I/O Station screen displays.
6. Follow the instructions on the screen.

From the Operator Panel

Use the following steps to insert a cleaning cartridge into the UltraScalable Tape Library:

1. Ensure that automatic cleaning is enabled (see "Enabling or Disabling Automatic Cleaning" on page 78).
2. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Insert Cleaning Cartridge, then press ENTER.
5. The library displays the message **Insert Cleaning Cartridge into I/O station before you continue. Do you want to continue?**
6. Open the door of the I/O station that you want to use and insert a cartridge as follows (see Figure 27 on page 71):
   - For LTO Ultrium I/O slots, insert an Ultrium tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the right.
   - For DLT I/O slots, insert a DLT tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the left.
7. Repeat step 6 for each cartridge that you want to insert.
8. Close the door of the I/O station.
9. Press YES. The message **Moving cleaning cartridge** displays while the library scans for one or more cleaning cartridges in the I/O stations:
   - If one or more cleaning cartridges are present, the library moves the cleaning cartridges (one by one) to the lowest empty slots. If the library uses both LTO and DLT tape cartridges, the accessor moves each cleaning cartridge to a storage location that contains like media (using a separate move operation for each type of media). The library displays the message **Insertion of Cleaning Cartridges has completed**.
   - If no cleaning cartridges are in the I/O stations, the library displays the message **No cleaning cartridge found in the I/O station**.
10. Press ENTER to return to the Manual Operations menu.
11. Press BACK until you return to the Activity screen.

Inserting a Cleaning Cartridge with Automatic Cleaning Disabled

To insert a cleaning cartridge into the UltraScalable Tape Library when automatic cleaning is disabled:

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Ensure that automatic cleaning is disabled (see "Enabling or Disabling Automatic Cleaning" on page 78).
2. Open the door of the I/O station that you want to use and insert a cartridge as follows (see Figure 27 on page 71):
   - For LTO Ultrium I/O slots (black), insert an Ultrium tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the right.
   - For DLT I/O slots (gray), insert a DLT tape cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the left.
3. Repeat step 2 for each cartridge that you want to insert.
4. Close the door of the I/O station.
5. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
6. Select **Manual Operations —> Insert Cleaning Cartridge**. The I/O Station screen displays.
7. Follow the instructions on the screen.

From the Operator Panel

Use the following steps to insert a cleaning cartridge into the UltraScalable Tape Library when automatic cleaning is disabled:

1. Ensure that automatic cleaning is disabled (see "Enabling or Disabling Automatic Cleaning" on page 78).
2. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Insert Cleaning Cartridge, then press ENTER. The Select Logical Library screen displays with a field for you to specify the

number of the logical library that you want to clean. Press UP or DOWN to highlight the number of the logical library into which you want to insert the cleaning cartridge, then press ENTER.

```
Select Logical Library       Panel 0025

Select a logical library:

Logical Library 1
Media Type: LTO

[BACK]  [ UP ]  [ENTER]
```

The library displays the message **Insert Cleaning Cartridges into I/O Station before you continue. Do you want to continue?**

5. Open the door of the I/O station that you want to use and insert a cartridge as follows (see Figure 27 on page 71):
   - For LTO I/O slots (black), insert an LTO Ultrium Tape Cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the right.
   - For DLT I/O slots (gray), insert a DLT Tape Cartridge so that the bar code label faces the interior of the library and the write-protect switch is on the left.

   Note: If, in step 4 on page 82, you selected a DLT library and only LTO cartridges are in the I/O station (or if you selected an LTO library and only DLT cartridges are in the I/O station), the library displays the message **Unable to insert cleaning cartridge, logical library selected is incorrect media type**.
6. Repeat step 5 for each cartridge that you want to insert.
7. Close the door of the I/O station.
8. Press YES. The message **Moving cleaning cartridge** displays while the library scans for one or more cleaning cartridges in the I/O stations.
   - If one or more cleaning cartridges are present, the library moves the cleaning cartridges (one by one) to the lowest empty slots of the logical library that you specified. If the library uses both LTO and DLT tape cartridges, the accessor moves each cleaning cartridge to a storage location that contains like media (using a separate move operation for each type of media). The library displays the message **Insertion of Cleaning Cartridges has completed**.
   - If no cleaning cartridges are in the I/O stations, the library displays the message **No cleaning cartridge found in the I/O station**.
9. Press ENTER to return to the Manual Operations menu.
10. Press BACK until you return to the Activity screen.

Performing a Manual Cleaning Operation

Attention: Before performing a manual cleaning operation, make sure that the tape drive is empty. If a cartridge is in the tape drive, the cleaning operation may hang. To determine whether the drive is empty, see “Drive Status” on page 96.

IBM does not recommend that you clean a drive on a periodic basis; the drive detects when a drive needs cleaning and the library displays a message that indicates which drive needs to be cleaned. However, if the library does not issue a message and you determine that a specific tape drive needs to be cleaned, perform the manual cleaning operation.

To perform manual cleaning, use one of the following methods:

From the Web

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Clean Drive**. The Drives screen displays all of the drives in the library.
3. Follow the instructions on the screen.

From the Operator Panel

1. From the library’s Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Clean Drive, then press ENTER. The Select Drive screen displays with a list of tape drives in the library. The drives are listed by their logical SCSI element addresses (in both decimal and hexadecimal format) and their physical frame and row locations. The physical locations are listed as [Fx,Rzz] (where F equals a frame and x equals its number, and where R equals a row and zz equals its number).

   The screen gives the generation of the drive as Lx, where x equals 1 (the LTO Ultrium-1 drive) or 2 (the LTO Ultrium-2 drive).

```
Select Drive       Panel 0028

Key: [F=Frame, R=Row] L=LTO Ultrium

257    101h    Drive [F01,R01]  L1
258    102h    Drive [F01,R02]  L1
259    103h    Drive [F01,R03]  L2
260    104h    Drive [F01,R04]  L2
261    105h    Drive [F01,R05]  L2
262    106h    Drive [F01,R06]  L1
263    107h    Drive [F01,R07]  L1
264    108h    Drive [F01,R08]  L1
265    109h    Drive [F01,R09]  L1
266    10Ah    Drive [F01,R10]  L1

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight that drive that you want to clean, then press ENTER. The library locates a cleaning cartridge and moves it to the drive that you specified. The message **Cleaning is queued for drive [Fx,Rzz]** displays and the cleaning cartridge with the highest usage count cleans the head of the drive. For Ultrium Tape Cartridges, the cleaning cycle takes up to 2 minutes; for DLT Tape Cartridges, the cleaning cycles takes up to 6 minutes. The library then returns the cleaning cartridge to its original slot and displays the message **Drive [Fx,Rzz] has been cleaned** (see the preceding explanation for Fx,Rzz).

   Note: If the message **No cleaning cartridges in the library** displays, press ENTER to return to the Manual Operations menu, then refer to the instructions in “Inserting a Cleaning Cartridge into the Library” on page 80.

5. Press ENTER to return to the Select Drive screen.
6. To clean another drive, repeat step 4.
7. Press BACK until you return to the Activity screen.

Removing a Cleaning Cartridge from the Library

To remove a cleaning cartridge from the UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Remove Cleaning Cartridge**. The Cleaning Cartridges screen displays.
3. Follow the instructions on the screen to specify the cleaning cartridge and remove it to the I/O station.
4. Look at the Activity screen to determine whether the I/O station that you want to use is locked or unlocked. If the station is locked, use your application software to unlock it.
5. Open the door of the I/O station and remove the cleaning cartridge.
6. Close the door of the I/O station.

From the Operator Panel

Use the following steps to remove a cleaning cartridge from the UltraScalable Tape Library:

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [ UP ]          [ENTER]
```

3. Press UP or DOWN to highlight Remove Cleaning Cartridge, then press ENTER. The Select Cleaning Cartridge screen displays with a list of the cleaning cartridges in the library and a count of how many times they have been used. For libraries that use both LTO and DLT media, the screen also indicates whether the cartridge is an LTO cartridge or DLT cartridge. To display more cleaning cartridges, press DOWN; to return to cartridges that you have viewed, press UP.

```
Select Cleaning Cartridge        Panel 0220

CLN001      020     DLT
CLNI02L1    020     LTO
CLNI03L1    015     LTO
CLNI04L1    010     LTO
CLN005      005     DLT
CLN006      000     DLT
CLNI07L1    000     LTO
CLN008      000     DLT
CLN009      000     DLT
CLNU10L1    000     LTO

[BACK]  [ UP ]  [DOWN]
```

4. Press UP or DOWN to highlight the cleaning cartridge that you want to remove, then press ENTER to remove the cartridge to an empty slot in an I/O station:
   - If a cleaning cartridge is present, the library begins the removal and displays the message **Move in Progress**. After the library places the cleaning cartridge into an I/O station, **Move Complete** displays.
   - If no empty slot is available in an I/O station, the library displays the message **The Destination Element is Full. Please remove cartridges and restart operation**. Open the door of the I/O station and remove one or more cartridges, then press ENTER to resume the operation.
5. Press ENTER to return to the Manual Operations menu.
6. Press BACK until you return to the Activity screen.
7. Open the door of the I/O station and remove the cleaning cartridge.

Initializing a Tape's Volume Serial (VOLSER) Number

Many tape management applications use Standard Label tape processing. To maintain compatibility with this type of processing, the VOLSER on the bar code label must match the VOLSER written to the tape.

Use the following steps to initialize tape cartridges:

1. Attach a bar code label to the recessed label location on each tape cartridge (for LTO Ultrium Tape Cartridges, see "Bar Code Label" on page 200; for DLT Tape Cartridges, see "Bar Code Label" on page 222).
2. Insert the cartridges into the library (see "Inserting Cartridges into the Library" on page 70).
3. Use your software application to write the bar code VOLSER to the tape (for more information, see the documentation for your software application).

Setting Your Initial Admin Password

Use this procedure to establish your initial admin password or to reset your admin password. This procedure can only be performed from the operator panel.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]          [ENTER]
```

4. Press UP or DOWN to highlight Web Server, then press ENTER. The Web Server menu displays.

```
Web Server              Panel 0186

Reset Admin Password

[BACK]                  [ENTER]
```

5. Press ENTER. One of the following occurs:
   - If web security is enabled, the Web Server menu displays text that reads `Your 'admin' password has been set to xxxxxxxx` (where `xxxxxxxx` equals a value that is assigned by the library). If you would like to change your password, see “Changing Your Password” on page 92.
   - If web security is disabled, the Web Server menu displays text that reads `Your 'admin' password has been set to xxxxxxxx but your web security is disabled. To enable web security you must use the web user interface`. Go to “Managing User IDs on the Web” on page 90.
6. Press BACK until you return to the Activity screen.

Activating or Deactivating Password Protection

The function of choosing password protection is available only through the UltraScalable Specialist web interface; it is not available through the operator panel.

The UltraScalable Specialist web interface offers two levels of security access for its screens. Prior to performing library functions, you must choose the type of security access that you need. Table 16 describes each level.

Table 16. Types of password protection

Type of Password Protection	Description
No password protection	You are never prompted to sign on.
Password protection	You are prompted to sign on whenever you access the interface.

The factory default for the UltraScalable Specialist is no password protection.

To activate or deactivate password protection, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **Settings —> Security**. The Security screen displays the current status of password protection:
   - ON for password protection
   - OFF for no password protection
3. Enter an administrator user ID and password.
4. Select the Apply button to toggle password protection. The screen redisplays the new setting.

Managing User IDs on the Web

When enabling password protection, the administrator may want to reserve some functionality for specific users. The web interface uses the concept of roles to restrict or enable specific actions that can be performed by selected users. The roles include:

Monitor Can view all physical and logical library data.

Service Can perform only service-related functions, such as update firmware, download logs, and view VPD.

Superuser Can perform all tasks of a monitor or service role, plus change library settings and perform library operations. This role cannot change the password of others, or enable or disable security.

Administrator Can perform all user management tasks.

Note: Any user can change their own password.

Adding a New User ID

Note: To add a new user ID, password protection must be on (see “Activating or Deactivating Password Protection” on page 89).

You can create up to nineteen additional user IDs. To add a user ID, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **User Management —> Manage Users**.
3. Select the Create button.
4. Enter a user ID in the User ID field (the user ID can be up to fifteen case-sensitive, alphanumeric characters).
5. Using the Role drop-down box, select a role for the new user ID.
6. Enter any comments, up to 30 characters, about the new user in the Comments field. Suggested comments are the user’s full name, job responsibility, or anything that helps associate the user ID with the user.
7. Enter the password in the Password field (the password can be up to fifteen case-sensitive, alphanumeric characters).
8. Select the Apply button. The library displays a message indicating that the new user ID was successfully created.

To change the new password, see “Changing Your Password” on page 92).

Modifying a User's Settings

To modify a user's settings, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **User Management —> Manage Users**.
3. Select the radio button next to the appropriate user ID.
4. Select the Update button.
5. Edit the user ID, role, Password field, or Comment field.

   Note: For the admin ID, the ID and the role cannot be changed.
6. Select the Apply button.

Removing a User

To remove a user, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **User Management —> Manage Users**.
3. Select the radio button next to the appropriate user ID.
4. Select the Remove button.

   Note: You cannot delete the admin ID.
5. At the prompt `Are you sure?` select the Yes button.

Changing Your Password

From the Web

Any user can change their own password.

To change your password, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **User Management —> Change Password**.
3. Enter the new password.
4. Re-enter the new password.
5. For verification, enter your current password
6. Select Apply. A confirmation screen displays and indicates that your password has successfully been changed.

From the Operator Panel

Use this procedure to establish your initial admin password or to reset your admin password.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                   Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays.

```
Network              Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]          [ENTER]
```

4. Press UP or DOWN to highlight Web Server, then press ENTER. The Web Server menu displays.

```
Web Server              Panel 0186

Reset Admin Password

[BACK]                  [ENTER]
```

5. Press ENTER. One of the following occurs:
   - If web security is enabled, the Web Server menu displays text that reads `Your 'admin' password has been set to xxxxxxxx` (where `xxxxxxxx` equals a value that is assigned by the library). If you would like to change your password, see “Changing Your Password” on page 92.
   - If web security is disabled, the Web Server menu displays text that reads `Your 'admin' password has been set to xxxxxxxx but your web security is disabled. To enable web security you must use the web user interface`. Go to “Managing User IDs on the Web” on page 90.
6. Press BACK until you return to the Activity screen.

Viewing Users with Active Sessions

To view the users who are currently connected to the UltraScalable Specialist, perform the following steps:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Home screen displays.
2. Select **User Management —> Active Sessions**. The Active Sessions screen displays a list of users who are currently connected to the UltraScalable Specialist. The maximum number of active users is five. The Active Sessions screen displays the following information:

   Userid
   The user ID of the person who is connected to the UltraScalable Specialist.

   Role Responsibility that is assigned to the person who is connected to the UltraScalable Specialist.

   Connect Time
   The amount of time the user has been connected to the UltraScalable Specialist. Specified in hours (`hh`) and minutes (`mm`).

Determining Library Status

This section describes how to determine the status of the UltraScalable Tape Library's accessor, tape drives, I/O stations, storage slots, and cartridges.

Accessor Status

To determine whether tape cartridges are present in the cartridge accessor, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> Accessor**. The Accessor screen displays the state of operation for the accessor and two grippers. It also gives usage statistics.

From the Operator Panel

Use the following steps to determine whether tape cartridges are present in the cartridge accessor:

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Accessor Status and press ENTER. The Accessor Status screen displays.

```
Accessor Status              Panel 0004

  Accessor A - Online
    Gripper 1 - Operational
                LTO
    Gripper 2 - Failed VOL031
                DLT

[BACK]
```

If a cartridge is present in a gripper, the screen displays the cartridge's VOLSER number. If no cartridge is present, the screen indicates that the gripper is `Operational`. If the screen displays `Failed` and a cartridge's VOLSER, a problem has occurred with that cartridge. If the screen simply displays `Failed`, the gripper is empty but broken, and a message about its failed status is reported to the Activity screen. If the library cannot read the VOLSER, the screen displays `Unknown`. For libraries that use both LTO and DLT media, the Accessor Status screen lists the type of media in each gripper.

To show current status, the Accessor Status screen refreshes every 10 seconds.

4. Press BACK until you return to the Activity screen.

Drive Status

To determine whether the tape drives are functioning properly and contain tape cartridges, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select one of the following:
   - **Physical Library —> Drives** (presents the drives by frames)
   - **Logical Library —> Drives** (presents the drives by logical libraries)

   The Drives screen displays the state of operation for all of the drives in the library.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Drive Status, then press ENTER. The Drive Status screen displays:

```
Drive Status              Panel 0005

Key: L=LTO Ultrium

Frame 1   Media type: LTO

Drive 1   L1  Online    VOL110L1
Drive 2   L1  CommFail
Drive 3   L2  Online    Empty
Drive 4   L2  Online    VOL111L1
Drive 5   L2  Offline   Empty
Drive 6   L2  CommFail
Drive 7   Not Installed

[BACK]  [ UP ]  [DOWN]
```

If you have more than one frame, scroll through the frames by pressing UP or DOWN. For libraries that use both LTO and DLT media, the Drive Status screen lists the type of media in each frame. The screen lists the drives and (if they are LTO Ultrium drives) gives their generation as `Lx`, where `x` equals 1 (the LTO Ultrium-1 drive) or 2 (the LTO Ultrium-2 drive). The screen indicates whether each drive is functioning properly (`Online`), is offline for service (`Offline`), has an RS-422 connection to the library that is not functioning (`CommFail`) or is communicating over the RS-422 interface but is not usable (`Failed`). If a cartridge is present in a drive, the screen displays the cartridge's VOLSER number; if no cartridge is present, the screen displays `Empty`.

To show current status, the Drive Status screen refreshes every 10 seconds.

4. Press BACK until you return to the Activity screen.

Control Port Status

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> Control Ports**. The Control Ports screen displays the control ports in the library and lists the status for each.

From the Operator Panel

If your library uses both LTO and DLT media, and you want to determine the number of DLT ports that are in use per frame, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Control Port Status, then press ENTER. The Control Port Status screen displays:

```
Control Port Status             Panel 0017

  Frame 2

    CPort 0   Online
    CPort 2   CommFail
    CPort 3   Online

[BACK]  [ UP ]  [DOWN]
```

The first time that this screen displays, it shows Frame 2, CPorts 1 - x, where CPorts equals control ports and x equals the quantity of ports per DLT frame. If you have more than one frame, scroll through them by pressing UP or DOWN to view the status of the control ports in each frame. The Control Port Status screen indicates whether each port is functioning properly (Online) or is not communicating with the library (CommFail).

To show current status, the Control Port Status screen refreshes every 10 seconds.

4. Press BACK until you return to the Activity screen.

I/O Station Status

To determine whether one or more tape cartridges are present in an I/O station, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> I/O Station**. The I/O Station screen displays the total contents of both I/O stations.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight I/O Station Status, then press ENTER. The I/O Station Status screen displays.

For libraries that use both LTO and DLT media, the screen shows the type of media used in each I/O station. It lists the storage slots in the I/O station and indicates whether they are occupied by a cartridge or are empty. If occupied, the cartridge is identified by its VOLSER number.

```
I/O Station Status        Panel 0006

Media Type: LTO

    Slot 1   VOL110L1
    Slot 2   Empty
    Slot 3   Empty
    Slot 4   VOL111L1
    Slot 5   Empty
    Slot 6   Empty
    Slot 7   Empty
    Slot 8   Empty
    Slot 9   Empty
    Slot 10  Empty

[BACK]  [UP]   [DOWN]
```

To show current status, the I/O Station Status screen refreshes every 10 seconds.

4. Press UP or DOWN to redisplay the next or previous ten I/O slots.
5. Press BACK until you return to the Activity screen.

Storage Slot Status

To determine how many storage slots in the library are occupied, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select one of the following:
   - **Physical Library —> Storage Slots** (presents the storage slots by frames)
   - **Logical Library —> Storage Slots** (presents the storage slots by logical libraries)

   The Storage Slots screen indicates the quantity of storage slots that are installed and the quantity that are empty. For the column and row location of the cartridge, as well as its VOLSER, select the Details button.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Storage Slot Status, then press ENTER. The Storage Slot Status screen displays.

```
Storage Slot Status        Panel 0008

Library Totals              LTO       DLT
  Cartridges
     Data:                   20        41
       Ultrium-1:            10         0
       Ultrium-2:            10         0
     Cleaning:                0         0
  Empty Slots:              155       305
  Total Capacity:           175       346

Frame 1 Totals
  Cartridges
     Data:                   20         0
       Ultrium-1:            10         0
       Ultrium-2:            10         0
     Cleaning:                0         0
  Empty Slots:              155         0
  Total Capacity:           175         0

[BACK]  [ UP ]  [DOWN]   [DETAIL]
```

For libraries that use both LTO and DLT media, the Storage Slot Status screen shows the totals of each type of media. For both the library and the frame that you specify, the screen lists the quantity of data cartridges and cleaning cartridges, as well as the quantity of empty slots. (If the library contains only one frame, the Frame Totals are redundant and are not displayed.) To specify the number of a frame, press UP or DOWN to increment or decrement the value. To determine which slots are occupied, press DETAIL. The Storage Slot Detail screen displays.

```
Storage Slot Detail    Panel 0010

Key: [F=Frame, C=Column, R=Row]

Media Type: LTO

[F01,C01,R01]     VOL011L1
[F01,C01,R02]     VOL012L1
[F01,C01,R03]     VOL013L1
[F01,C01,R04]     VOL014L1
[F01,C01,R05]     CLNI01L1
[F01,C01,R06]     VOL015L1
[F01,C01,R07]     VOL016L1
[F01,C01,R08]     VOL017L1
[F01,C01,R09]     VOL018L1
[F01,C01,R10]     VOL019L1

[BACK]  [ UP ]  [DOWN]
```

For libraries that use both LTO and DLT media, the Storage Slot Detail screen shows the type of media used in each frame. The screen lists the location of occupied storage slots in the library as `[Fx,Cyy,Rzz]` (where `F` equals frame and `x` equals its number, `C` equals column and `yy` equals its number, and `R` equals row and `zz` equals its number). In addition, the screen identifies the cartridge that occupies the slot by its VOLSER number. To view additional slots, press DOWN; to return to slots that you have viewed, press UP.

4. Press BACK until you return to the Activity screen.

Cartridge Locations

To determine the location of any tape cartridge in the library, use one of the following methods.

Note: You can locate a data cartridge by specifying its VOLSER in the UltraScalable Specialist. This function is not available, however, from the library's operator panel.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select one of the following:
   - **Physical Library —> Data Cartridge** or **Cleaning Cartridge**
   - **Logical Library —> Data Cartridge**

   If you are searching for a data cartridge, the Data Cartridges screen displays; if you are searching for a cleaning cartridge, the Cleaning Cartridges screen displays. If you are searching for a data cartridge in a logical library, the Data Cartridges screen displays.

   From the preceding screen, you can make selections to view the cartridges in the entire library or in a specific frame. You can view the cartridges by VOLSER, physical location, or SCSI element address. You can also locate a data cartridge by specifying its entire or partial VOLSER.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Library Status, then press ENTER. The Library Status screen displays.

```
Library Status              Panel 0003

Accessor Status
Drive Status
Control Port Status
I/O Station Status
Storage Slot Status
Cartridge Locations

[BACK]  [ UP ]  [ENTER]
```

3. Press UP or DOWN to highlight Cartridge Locations, then press ENTER. For libraries that use both LTO and DLT media, the Select Media Type screen displays.

```
Select Media Type              Panel 0030

LTO Media Type
DLT Media Type

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight the media type that you want (LTO or DLT), then press ENTER. The Cartridge Locations screen displays.

```
Cartridge Locations        Panel 0009

Key: [F=Frame, C=Column, R=Row]

Media Type: LTO

VOL001L1   Slot   [F01,C03,R01]
VOL002L1   Drive  [F02,R03]
VOL003L1   I/O    [F01,R03]
VOL004L1   Slot   [F01,C03,R01]
VOL005L1   Slot   [F01,C03,R02]
VOL006L1   Slot   [F01,C03,R03]
VOL007L1   Slot   [F01,C03,R04]
VOL008L1   Slot   [F01,C03,R05]
VOL009L1   Slot   [F01,C03,R06]
VOL010L1   Slot   [F01,C03,R07]

[BACK]  [ UP ]  [DOWN]
```

The screen shows the location of each cartridge in each frame (whether in a storage slot, drive, or I/O station slot). The cartridges are sorted by their VOLSER number and their location is given as `[Fx,Cyy,Rzz]` or `[Fx,Rzz]`, (where `F` equals frame and `x` equals its number, `C` equals column and `yy` equals its number, and `R` equals row and `zz` equals its number). To view additional cartridges, press DOWN; to return to cartridges that you have viewed, press UP.

5. Press BACK until you return to the Activity screen.

Performing an Inventory of the Library

To perform an inventory of the entire library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Inventory Library**. The Inventory Library screen displays with options for performing an inventory on a single frame or on all frames.
3. Select All Frames, then follow the instructions on the screen.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002
Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Inventory, then press ENTER. The Inventory menu displays.

   Note: If only one frame exists in the library, the menu displays `Inventory Library`; if more than one frame exists in the library, the menu displays `Inventory Library` and `Inventory Frame`.

```
Inventory                   Panel 0016

Inventory Library

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. If necessary, press UP or DOWN to highlight Inventory Library, then press ENTER. The library displays the warning message **If you continue all jobs in the work queue will be delayed while the inventory is performed. Press ENTER to continue.**

5. Press ENTER. The message **Inventory in Progress** displays, and the inventory of the library begins. When the inventory is finished, **Inventory Complete** displays.
6. Press ENTER to return to the Inventory menu.
7. Press BACK until you return to the Activity screen.

Note: The host application must request the library inventory to be uploaded. The library does not automatically perform this function.

Performing an Inventory of a Frame

To perform an inventory of a frame, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Inventory Library**. The Inventory Library screen displays with options for performing an inventory on a single frame or on all frames.
3. Select the frame that you want to inventory, then follow the instructions on the screen.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Inventory, then press ENTER. The Inventory menu displays.

   Note: If only one frame exists in the library, the menu displays `Inventory Library`; if more than one frame exists in the library, the menu displays `Inventory Library` and `Inventory Frame`.

```
Inventory                    Panel 0016

Inventory Library
Inventory Frame

[BACK]  [ UP ]          [ENTER]
```

4. Press UP or DOWN to highlight Inventory Frame, then press ENTER. The library displays the warning message **If you continue all jobs in the work queue will be delayed while the library inventory is performed. Press ENTER to continue.** Press ENTER. The Select Frame screen displays.

```
Select Frame             Panel 0007

Select a frame:

Frame Number 2
Media Type: LTO

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Specify the number of the frame that you want by pressing UP or DOWN to increment or decrement the value. For libraries that use both LTO and DLT media, the Select Frame screen shows the type of media used in the frame that you selected.
6. When the desired frame number displays, press ENTER. The message **Inventory in Progress** displays, and the inventory of the frame begins. When the inventory is finished, **Inventory Complete** displays.
7. Press ENTER to return to the Inventory menu.
8. Press BACK until you return to the Activity screen.

Moving a Cartridge

Note: The UltraScalable Tape Library will reject a SCSI command to move a cartridge with an Ultrium 2 VOLSER to an Ultrium 1 drive (Ultrium 2 VOLSERs end in L2).

At times, you may want to tell the library to move a specific tape cartridge. For example, if a single host controls the library and the host fails during an operation, you can use menus on the web or operator panel to move cartridges and continue the operation.

To move a specific cartridge in the UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Manual Operations —> Move Cartridge**. The Data Cartridges screen displays.
3. Follow the instructions on the screen.

From the Operator Panel

1. Vary the library offline at the host.
2. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Manual Operations, then press ENTER. The Manual Operations menu displays.

```
Manual Operations         Panel 0015

Inventory
Move Cartridge
Clean Drive
Insert Cleaning Cartridge
Remove Cleaning Cartridge

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Move Cartridge, then press ENTER. The Select Source screen displays. You can specify which cartridge to move by its VOLSER, SCSI element address, or frame, column, and row location. Choices are available for DLT cartridges and LTO Ultrium cartridges.

```
Select Source               Panel 0020

DLT - By VOLSER
DLT - By SCSI Element Address
DLT - By Location (F,C,R)
LTO - By VOLSER
LTO - By SCSI Element Address
LTO - By Location (F,C,R)

Key: [F=Frame, C=Column, R=Row]

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

   - To specify the cartridge (in this example, an LTO cartridge) to be moved by its VOLSER, highlight **LTO - By VOLSER** and press ENTER. The Select Source Volume screen displays with one of the following:
     - A list of LTO cartridges in the library, identified by their VOLSERs and their physical locations.
     - A range of LTO cartridges in the library, identified by their VOLSERs and their physical locations.

     Cartridge locations are listed as [Fx,Cyy,Rzz] or [Fx,Rzz], (where F equals frame and x equals its number, C, equals column and yy equals its number, and R equals row and zz equals its number). Perform one of the following:
     - Press UP or DOWN to select the VOLSER of the cartridge that you want, then press ENTER.
     - Press UP or DOWN to select the range of VOLSERs that contains the cartridge that you want, then press ENTER (if your library contains a large quantity of cartridges, you may have to repeat this step until you locate the range that contains the cartridge that you want). Press UP or DOWN to select the VOLSER of the cartridge that you want and press ENTER.

```
Select Source Volume        Panel 0022

Key: [F=Frame, C=Column, R=Row]
     L=LTO Ultrium

Media Type: LTO

VOL011L1    Slot   [F01,C03,R01]
VOL012L1    Drive  [F02,R03] L2
VOL013L1    I/O    [F01,R03]
VOL014L1    Slot   [F01,C03,R01]
VOL015L1    Slot   [F01,C03,R02]
VOL016L1    Slot   [F01,C03,R03]
VOL017L1    Slot   [F01,C03,R04]
VOL018L1    Slot   [F01,C03,R05]
VOL019L1    Slot   [F01,C03,R06]
VOL020L1    Slot   [F01,C03,R07]

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

- To specify the cartridge (in this example, an LTO cartridge) to be moved by a specific SCSI element address, highlight **LTO - By SCSI Element Address** and press ENTER. The Select Source Element screen displays with one of the following:
  - A list of LTO cartridges in the library, identified by their SCSI element addresses (in both decimal and hexadecimal format) and their VOLSERs.
  - A range of LTO cartridges in the library, identified by their SCSI element addresses (in both decimal and hexadecimal format).

  Perform one of the following:
  - Press UP or DOWN to select the SCSI element address of the cartridge that you want, then press ENTER.
  - Press UP or DOWN to select the range of SCSI element addresses that contains the cartridge that you want, then press ENTER (if your library contains a large quantity of cartridges, you may have to repeat this step until you locate the range that contains the cartridge that you want). Press UP or DOWN to select the SCSI element address of the cartridge that you want and press ENTER.

```
Select Source Element       Panel 0023

Media Type: LTO

1025   401h   VOL011L1
1026   402h   VOL012L1
1027   403h   VOL013L1
1028   404h   VOL014L1
1029   405h   CLNI01L1
1030   406h   VOL015L1
1031   407h   VOL016L1
1032   408h   VOL017L1
1033   409h   VOL018L1
1034   40Ah   VOL019L1

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

- To specify the cartridge (in this example, an LTO cartridge) to be moved by a specific frame, column, or row location, highlight **LTO - By Location (F,C,R)** and press ENTER. The Select Source Location screen displays with one of the following:
  - A list of LTO cartridges in the library, identified by their physical frame, column, or row location and their VOLSERs.
  - A range of LTO cartridges in the library, identified by their physical frame, column, or row locations.

  The locations are listed as `[Fx,Cyy,Rzz]` or `[Fx,Rzz]`, (where `F` equals frame and `x` equals its number, `C` equals column and `yy` equals its number, and `R` equals row and `zz` equals its number). Perform one of the following:
  - Press UP or DOWN to select the physical frame, column, or row location of the cartridge that you want, then press ENTER.
  - Press UP or DOWN to select the range of physical frame, column, or row locations that contains the cartridge that you want, then press ENTER (if your library contains a large quantity of cartridges, you may need to repeat this step until you locate the range that contains the cartridge that you want). Press UP or DOWN to select the physical frame, column, or row location of the cartridge that you want and press ENTER.

```
Select Source Location         Panel 0024

Key: [F=Frame, C=Column, R=Row]
     [L=LTO Ultrium]

Media Type: LTO

Drive  [F02,R12] L1   VOL003L1
I/O    [F01,R01]      VOL004L1
Slot   [F01,C01,R01]  VOL005L1
Slot   [F01,C01,R02]  VOL006L1
Slot   [F01,C02,R01]  VOL007L1
Slot   [F02,C01,R02]  CLNI01L1
Slot   [F02,C01,R03]  CLNI02L1
Slot   [F02,C01,R04]  VOL008L1

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

The library locates the cartridge to be moved and performs one of the following:

- If the cartridge is already assigned to a logical library, the library displays the Select Destination screen.

```
Select Destination              Panel 0021

First Empty Storage Slot
By SCSI Element Address
By Location (F,C,R)

Key: [F=Frame, C=Column, R=Row]

[BACK]          [DOWN]  [ENTER]
```

- If the cartridge is not assigned to a logical library, the Select Logical Library screen displays. You must specify the number of the logical library into which you want to move the cartridge by pressing UP or DOWN to increment or decrement the value. When the desired number displays, press ENTER. The library displays the Select Destination screen.

```
Select Logical Library       Panel 0025

Select a logical library:

Logical Library 2

Media Type: LTO

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. In the Select Destination screen, you can specify that the library move the cartridge into the first empty storage slot, a slot with a specific SCSI element address, or a slot with a specific frame, column, and row location.
   - To move the cartridge to the first available empty slot, press UP or DOWN to highlight **First Empty Storage Slot** and press ENTER.

     Note: If the cartridge was previously loaded in a specific logical library, the move operation is restricted to that logical library.

- To move the cartridge to a location with a specific SCSI element address, press UP or DOWN to highlight **By SCSI Element Address** and press ENTER. The Select Destination Element screen displays with one of the following:
  - A list of the library's SCSI element addresses for drives, I/O station slots, and storage slots that have been configured and are empty. The SCSI element addresses display in both decimal and hexadecimal format. The screen also lists the physical locations of these SCSI element addresses.
  - A range of the library's SCSI element addresses for drives, I/O station slots, and storage slots that have been configured and are empty. The SCSI element addresses display in decimal and hexadecimal format.

  The physical locations are listed as [Fx,Cyy,Rzz] or [Fx,Rzz], (where F equals frame and x equals its number, C equals column and yy equals its number, and R equals row and zz equals its number).

  The screen gives the generation of the drive as Lx, where x equals 1 (the LTO Ultrium-1 drive) or 2 (the LTO Ultrium-2 drive).

  Perform one of the following:
  - Press UP or DOWN to select the SCSI element address of the destination that you want, then press ENTER.
  - Press UP or DOWN to select the range of SCSI element addresses that contains the destination that you want, then press ENTER (if your library contains a large quantity of possible destinations, you may need to repeat this step until you locate the range that contains the destination that you want). Press UP or DOWN to select the SCSI element address of the destination that you want and press ENTER.

```
Select Destination Element       Panel 0026

Key: [F=Frame, C=Column, R=Row]
     L=LTO Ultrium

Media Type: LTO

257     101h   Drive    [F01,R01]  L1
258     102h   Drive    [F01,R02]  L2
769     301h   I/O      [F01,R03]  L2
1028    404h   Slot     [F01,C01,R04]
1029    405h   Slot     [F01,C01,R05]
1030    406h   Slot     [F01,C01,R06]
1031    407h   Slot     [F01,C01,R07]
1032    408h   Slot     [F01,C01,R08]
1033    409h   Slot     [F01,C01,R09]
1034    40Ah   Slot     [F01,C01,R10]

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Note: If the cartridge was previously loaded in a specific logical library, the move operation is restricted to that logical library.

- To move the cartridge to a specific frame, column, or row location, press UP or DOWN to highlight **By Location (F,C,R)** and press ENTER. The Select Destination Location screen displays with one of the following:
  - A list of the library's empty storage slots, I/O slots, or drives, identified by their physical frame, column, or row location.
  - A range of the library's empty storage slots, I/O slots, or drives, identified by their physical frame, column, or row location.

  The physical locations are listed as [Fx,Cyy,Rzz] or [Fx,Rzz], (where F equals frame and x equals its number, C equals column and yy equals its number, and R equals row and zz equals its number). Drives are further identified as L1 (Ultrium 1) or L2 (Ultrium 2). Perform one of the following:
  - Press UP or DOWN to select the frame, column, and row location of the destination that you want, then press ENTER.
  - Press UP or DOWN to select the range of frame, column, and row locations that contains the destination that you want, then press ENTER (if your library contains a large quantity of possible destinations, you may need to repeat this step until you locate the range that contains the destination that you want). Press UP or DOWN to select the frame, column, and row location of the destination that you want and press ENTER.

```
Select Destination Location         Panel 0027

Key: [F=Frame, C=Column, R=Row]
     L=LTO Ultrium

Media Type: LTO

Drive    [F01,R01]  L1
Drive    [F01,R02]  L2
I/O      [F01,R03]
Slot     [F01,C01,R04]
Slot     [F01,C01,R05]
Slot     [F01,C01,R06]
Slot     [F01,C01,R07]
Slot     [F01,C01,R08]
Slot     [F01,C01,R09]
Slot     [F01,C01,R10]

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

  Note: If the cartridge was previously loaded in a specific logical library, the move operation is restricted to that logical library.

  After you press ENTER, the message **Move in Progress** displays and the cartridge accessor moves the cartridge from the specified source to the specified destination. When the move is finished, **Move Complete** displays.

6. Press ENTER to return to the Manual Operations menu.
7. Press BACK until you return to the Activity screen.

Displaying the Existing Configuration

To display the UltraScalable Tape Library's current physical and logical configuration, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Perform one of the following:
   - Select **Physical Library —> Summary** for a physical configuration of the library
   - Select **Logical Library —> Summary** for a logical configuration of the library

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Configuration and press ENTER. The Configuration menu displays.

```
Configuration                  Panel 0101

Display Configuration
Configure Library
Advanced Configure

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Display Configuration and press ENTER. The Physical Configuration screen displays. The screen shows the total quantity of drives, storage slots, and I/O slots in the library's physical configuration. For

libraries that use both LTO and DLT media, the screen provides totals for each media type. It also shows the quantity of control ports (CPorts) for libraries that use DLT 8000 Tape Systems. The Mode field indicates the menu selection (Configure Library or Advanced Configure) that was used to create the current library configuration.

Note: If the frame is not configured, all values are set to 0.

```
Physical Configuration          Panel 0102

Total Frames:              6
      Total LTO:           4
      Total DLT:           2

Total Drives:             48
      Total LTO:          36
      Total DLT:          12

Total Storage Slots:    2009
      Total LTO:        1363
      Total DLT:         646

Total I/O Slots:          28
    Total LTO:            10
    Total DLT:            18

Total CPorts:              6

Mode: Advanced Configure

[BACK]                 [DETAIL]   [ENTER]
```

You can view the physical configuration for each frame, or you can view the configuration for each logical library:

- To view the quantity of physical drives, storage slots, I/O slots, and control ports in each frame, press DETAIL. The Configuration Details screen displays. For libraries that use both LTO and DLT media, the Media Type field indicates the type of media used in the frame.

  ```
  Configuration Details       Panel 0104

  Frame 1    Media Type: LTO

    Drives:           12
      Ultrium-1        6
      Ultrium-2        6
    Storage Slots:   175
    I/O Slots:        28

  [BACK]   [ UP ]   [DOWN]
  ```

  To view the details for additional frames, press UP. The Configuration Details screen displays for the next frame.

  ```
  Configuration Details       Panel 0104

  Frame 2      Media Type: DLT

    Drives:            8
    Storage Slots:   322
    I/O Slots:         0
    Control Ports:     4

  [BACK]   [ UP ]   [DOWN]
  ```

To return to frames that you have viewed, press DOWN. To return to the Physical Configuration screen, press BACK.

- To view the library's logical configuration, from the Physical Configuration screen press ENTER. The Configuration Summary screen displays. The screen shows the total quantity of storage slots and drives in the logical library configuration, and indicates which drives are control paths. It also indicates the quantity of control paths.

```
Configuration Summary       Panel 0103

Key: [F=Frame, C=Column, R=Row]


Logical Library 1
Media Type: LTO

Storage Slots:     0175
Elem Addr Range:   1025 - 1199
Location Start:    [F01,C01,R02]
Location End:      [F01,C08,R44]

Drives:            012
Elem Addr Range:   0257 - 0268
Location Start:    [F01,R01]
Location End:      [F01,R12]

Control paths:     002

[BACK]  [UP]
```

The Element Addr Range field is the range of SCSI element addresses defined for this logical library. The Control Paths field shows the location of each drive that is a control path. To view the summaries for additional logical libraries, press UP. The Configuration Summary screen displays for the next logical library.

```
Configuration Summary       Panel 0103

Key: [F=Frame, C=Column, R=Row]


Logical Library 2
Media Type: DLT

Storage Slots:     0322
Elem Addr Range:   1202 - 1523
Location Start:    [F02,C01,R03]
Location End:      [F02,C10,R36]

Drives:            002
Elem Addr Range:   0269 - 0270
Location Start:    [F02,R01]
Location End:      [F02,R02]

Control paths:     001

[BACK]  [DOWN]
```

To return to summaries that you have viewed, press DOWN.

5. Press BACK until you return to the Activity screen.

Configuring the Library without Partitions

When you configure the UltraScalable Tape Library, it performs the following functions:

1. Determines its existing physical configuration by searching for attached physical devices (such as frames, cartridge storage slots, drives, and I/O slots) and displays the physical configuration for your confirmation.
2. Determines its logical configuration by assigning the physical devices to one or more logical libraries:
   - If you configure the library without partitions, it assigns all physical devices to one logical library.
   - If you configure the library with partitions, it divides the physical devices between two or more logical libraries.
3. Automatically assigns default SCSI IDs to new drives, assigns a default control path drive for each logical library, calibrates any new devices, and performs an inventory.

To configure your library without partitions, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, refer to the appropriate section in "Configuring the Library by Using Labels" on page 123.

From the Operator Panel

1. Press ENTER to pause the library. The message **PAUSE in Progress** displays. The library parks the cartridge accessor in the base frame and displays the message **The library is now paused. Normal operations will resume in 30 seconds.**
2. Within 30 seconds, unlock and open the front door on any frame. If you do not open the door within 30 seconds, the Activity screen redisplays.
3. On the drive side of the library ensure that there are no logical library bar code labels on any tape drive or on the top of any storage slot column. (To remove logical library bar code labels, see the instructions in "Attaching and Removing Logical Library Bar Code Labels" on page 128.)
4. Close the front door and from the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [DOWN]  [ENTER]
```

6. Press UP or DOWN to highlight Configuration and press ENTER. The Configuration menu displays.

```
Configuration                  Panel 0101

Display Configuration
Configure Library
Advanced Configure

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

7. Press UP or DOWN to highlight Configure Library and press ENTER. The library reacts with one of the following responses:
   - If you had not previously configured a logical library with the Advanced Configure option, the library displays the message **If you continue with configuration the library will go offline. Press ENTER to continue.**
   - If you had previously configured a logical library with the Advanced Configure option, the library displays the message **The configuration was last set with the Advanced Configure option. If you continue you will lose this information. Press ENTER to continue.** Decide whether you want to lose the Advanced Configure information. If so, press ENTER. The library displays the message **If you continue with configuration the library will go offline. Press ENTER to continue.**
8. Press ENTER. The library displays the message **Ensure that physical configuration changes have been completed before you continue. Press ENTER to continue.** If you want to add or remove drives or frames to your configuration, press BACK until you return to the Activity screen, then contact your IBM Service Representative to add or remove the hardware.
9. Press ENTER. The library displays the message **Searching for installed devices** and may take approximately 2 to 6 minutes to discover the physical configuration, depending on the number of frames. The Physical Configuration screen displays with the library's existing physical configuration. The screen shows the total quantity of drives, storage slots, and I/O slots in the library's physical configuration. For libraries that use both LTO and DLT media, the screen provides totals for each media type. It also shows the quantity of control ports (CPorts) for libraries that use DLT 8000 Tape Systems, and indicates what method (mode) was last used to configure the library.

```
Physical Configuration          Panel 0102

Total Frames:              2
      Total LTO:           1
      Total DLT:           1

Total Drives:             13
      Total LTO:          11
      Total DLT:           2

Total Storage Slots:     497
      Total LTO:         175
      Total DLT:         322

Total I/O Slots:          28
    Total LTO:            10
    Total DLT:            18

Total CPorts:              1

Mode: Advanced Configure

[BACK]                  [DETAIL]   [ENTER]
```

10. Press ENTER. The library displays the message **Do you want to commit the new physical configuration?**
11. Perform one of the following steps:
    - Press YES to accept the new physical configuration and to set up a logical library configuration. The process may take 2 to 4 minutes, depending on the number of frames. The library displays the message **Searching for logical library labels** and then displays the Configuration Summary screen for Logical Library 1 (without partitioning, there is only one logical library). The screen contains the range of SCSI element addresses for the cartridge storage slots and the drives. It also gives the location of the control path (the first drive in each logical library must be a control path).
    - Press NO to reject the new configuration. The library displays the message **The configuration has not been updated.** Press ENTER to return to the Configuration screen.

    Note: Your application software may require you to write down the SCSI element addresses of the tape drives that are associated with that application. See Table 17 on page 122 for the range of physical locations of each SCSI element address (referred to as a DTE address).

```
Configuration Summary       Panel 0103

Key: [F=Frame, C=Column, R=Row]


Logical Library 1

Storage Slots:     0597
Elem Addr Range:   1025 - 1621
Location Start:    [F01,C01,R02]
Location End:      [F02,C10,R44]

Drives:            002
Elem Addr Range:   0257 - 0258
Location Start:    [F01,R01]
Location End:      [F01,R02]

Control paths:     002

[BACK]  [ENTER]
```

Table 17. Range of SCSI Data Transfer Element (DTE) addresses for tape drives in frames 1 through 16

Frame	Range of SCSI DTE Addresses for Tape Drives	
	Row 1	Row 12
1	257(X'101')	268(X'10C')
2	269(X'10D')	280(X'118')
3	281(X'119')	292(X'124')
4	293(X'125')	304(X'130')
5	305(X'131')	316(X'13C')
6	317(X'13D')	328(X'148')
7	329(X'149')	340(X'154')
8	341(X'155')	352(X'160')
9	353(X'161')	364(X'16C')
10	365(X'16D')	376(X'178')
11	377(X'179')	388(X'184')
12	389(X'185')	400(X'190')
13	401(X'191')	412(X'19C')
14	413(X'19D')	424(X'1A8')
15	425(X'1A9')	436(X'1B4')
16	437(X'1B5')	448(X'1C0')
Note: Addresses are given in decimal and hexadecimal format.		

12. Press ENTER to display the summary for each logical library. If the new logical configuration would move any drives or slots from one logical library to another and if there are cartridges in the library (the library is not empty), the library displays the message **Changes to the logical library configuration may cause some cartridges to become part of a different logical library. Do you want to continue?**
13. Perform one of the following:
    - Press YES to accept the new configuration (the library can take several minutes to process). When finished, it displays the message **The Configuration process is complete**.
    - Press NO to reject the new configuration. The library displays the message **The configuration has not been updated.** Press ENTER to return to the Configuration screen.
14. Press BACK until you return to the Activity screen.

Configuring the Library with Partitions

When you configure the UltraScalable Tape Library, it performs the following functions:

- Determines its existing physical configuration by searching for attached physical devices (such as frames, cartridge storage slots, drives, and I/O slots) and displays the physical configuration for your confirmation.
- Determines its logical configuration by assigning the physical devices to one or more logical libraries:
  - If you configure the library without partitions, it assigns all physical devices to one logical library.
  - If you configure the library with partitions, it divides the physical devices between two or more logical libraries.
- Automatically assigns default SCSI IDs to new drives, assigns a default control path drive for each logical library, calibrates any new devices, and performs an inventory.

You can partition the UltraScalable Tape Library into multiple logical libraries by using one of two methods:

- **Configuring the Library by Using Labels** This method requires that you manually label the storage elements (storage slots and drives) that you want in each logical library, then select Configure Library to identify them to the library. If you use this method, you can view the boundaries of your logical library whenever you open the front doors. However, because a logical library bar code label applies to an entire column of storage slots (and not individual slots), this method does not allow you to choose individual slots from that column. To use this method, refer to the following section.
- **Configuring the Library by Using Menus** This method requires that you choose the storage elements that you want by selecting them from the Advanced Configuration menu. If you use this method, it is unnecessary for you to manually label the library elements, and you can choose individual slots from any column. However, you cannot view the boundaries of your logical library whenever you open the front doors. To use this method, refer to “Configuring the Library by Using Menus” on page 132.

Configuring the Library by Using Labels

Preparing for the Configuration

1. Press ENTER to pause the library. The message **PAUSE in Progress** displays. The library parks the cartridge accessor in the base frame and displays the message **The library is now paused. Normal operations will resume in 30 seconds.**
2. Within 30 seconds, unlock and open the front door on any frame. If you do not open the door within 30 seconds, the Activity screen redisplays.
3. Determine the quantity and location of storage slot columns and tape drives that you want in each logical library (for the quantity of storage slots available in each column, see Table 37 on page 273, Table 38 on page 275, Table 40 on page 277, and Table 41 on page 279).
4. On the drive side of the library attach a logical library bar code label to each tape drive and storage slot column that you defined in step 3. If you are changing an old partition, remove any labels that defined the old partition. (To attach or remove logical library bar code labels, see the instructions in “Attaching and Removing Logical Library Bar Code Labels” on page 128.)

Attention: Ensure that the drives within each logical library are in contiguous locations. If the drives within a logical library span frames, ensure that the logical library label for Drive 12 of Frame n (where n is the number of the frame) matches the logical library label for Drive 1 of Frame n+1.

5. Close all doors of the library.

Performing the Configuration

To configure your library by using logical library bar code labels, use one of the following methods.

From the Web: To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Library Configuration**. The Logical Library Summary screen displays.
3. Select the Configuration Wizard link and follow the instructions on the screens until the Select Configuration Method screen displays.
4. Select the Automated configuration button, then select the Next button. The library scans the bar code labels and displays the logical libraries.
5. Follow the instructions on the screens to accept the configuration of the logical library.

From the Operator Panel:

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]          [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Configuration and press ENTER. The Configuration menu displays.

```
Configuration                 Panel 0101

Display Configuration
Configure Library
Advanced Configure

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Configure Library and press ENTER. The library displays the message **If you continue with configuration the library will go offline. Press ENTER to continue.**

   Note: If you had previously configured a logical library with the Advanced Configuration option, the library displays the message **The current configuration was created by selecting Advanced Configuration. If you continue with Configure Library you will lose all Advanced Configuration information. Press ENTER to continue.**

5. Press ENTER. The library displays the message **Ensure that any physical configuration changes have been completed before you continue.** If you want to add or remove drives or frames to your configuration, press BACK until you return to the Activity screen, then contact your IBM Service Representative to add or remove the hardware.
6. Press ENTER. The library displays the message **Searching for installed devices** and can take approximately 2 minutes to discover the physical configuration. The Physical Configuration screen displays with the library's existing physical configuration. The screen shows the total quantity of drives, storage slots, and I/O slots in the library's physical configuration. For libraries that use both LTO and DLT media, the screen provides totals for each media type. It also shows the quantity of control ports (CPorts) for libraries that use DLT 8000 Tape Systems.

```
Physical Configuration          Panel 0102

Total Frames:              6
      Total LTO:           4
      Total DLT:           2

Total Drives:             48
      Total LTO:          36
      Total DLT:          12

Total Storage Slots:    2009
      Total LTO:        1363
      Total DLT:         646

Total I/O Slots:          28
    Total LTO:            10
    Total DLT:            18

Total CPorts:              6

Mode: Advanced Configure

[BACK]                  [DETAIL]   [ENTER]
```

   The screen shows the total quantity of drives, storage slots, and I/O slots in the library's physical configuration.

7. Press ENTER. The library displays the message **Do you want to commit the new physical configuration?**

8. Perform one of the following:
   - Press YES to accept the new physical configuration and to set up any logical library configurations. The library displays the message **Searching for logical library labels** as it reads the labels that you previously attached. It then displays the Configuration Summary screen for Logical Library 1. The screen contains the range of SCSI element addresses for the cartridge storage slots and the drives.
   - Press NO to reject the new configuration. The library displays the message **The configuration has not been updated.** Press ENTER to return to the Configuration screen.

   Note: Your application software may require you to write down the SCSI element addresses of the tape drives that are attached to that application. Table 17 on page 122 gives the physical location of each SCSI element address (referred to as a DTE address).

```
Configuration Summary       Panel 0103

Key: [F=Frame, C=Column, R=Row]


Logical Library 1
Media Type: LTO

Storage Slots:     0100
Elem Addr Range:   1025 - 1124
Location Start:    [F01,C01,R02]
Location End:      [F01,C06,R44]

Drives:            004
Elem Addr Range:   0257 - 0260
Location Start:    [F01,R01]
Location End:      [F01,R04]

Control paths:     002

[BACK]                              [ENTER]
```

9. Press ENTER to display the Configuration Summary screen for each logical library. After displaying the Configuration Summary screen of the last logical library, the library displays the message **Do you want to commit the new logical configuration?**

   Note: If the new logical library configuration moves drives or slots from one logical library to another and if there are cartridges in the library (the library is not empty), the library displays the message **Changes to the logical library configuration may cause some cartridges to become part of a different logical library. This would make them unavailable to the logical library they are in now. Press ENTER to continue.**

10. Perform one of the following:
    - If you want to accept the new configuration, press YES to continue. The library displays the message **Writing new configuration to drives. This may take up to three minutes.** When finished, it displays the message **The configuration process is complete**.
    - If you do not want to move cartridges or drives to a new logical library, press NO to return to the Configuration screen, and move the labels to the storage slots and drives that you want. The library displays the message **The configuration has not been updated.** Press ENTER to return to the Configuration screen.
11. Press BACK until you return to the Activity screen.

Attaching and Removing Logical Library Bar Code Labels

Each frame of the UltraScalable Tape Library comes with the following supplies:

- Logical library labels that support up to 10 logical libraries
- Six holders for logical library labels

A sample label and holder are shown in Figure 33.

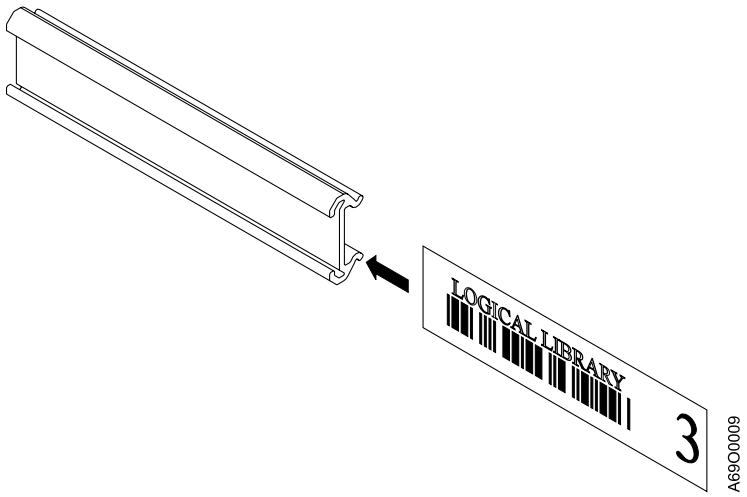

Figure 33. Logical library bar code label and holder

To label the storage slot columns and drives in your logical library, follow the procedures in Table 18 on page 129.

Table 18. Procedure for attaching and removing logical library bar code labels

Type of Element	Procedure for Attaching and Removing Logical Library Bar Code Labels
Storage slot columns	1. Tear a label from its sheet and slide it into a label holder (see Figure 33 on page 128). 2. On a storage slot column on the drive side of the frame (not on the door), locate the cell top cap (see **1** in Figure 34). 3. Slip the top lip of the label holder over the cell top cap, then press the center of the label holder. The holder snaps into place. To remove a label from a storage slot, lift the top lip of the label holder up and away from the cell top cap.
Drive	Tear a label from its sheet and slide it into the bezel of the drive (see **2** in Figure 34). To remove the label, simply slide it out of the end of the bezel.
Control port	No label necessary. The library assigns the control port to the same logical library as the next drive in the sequence.

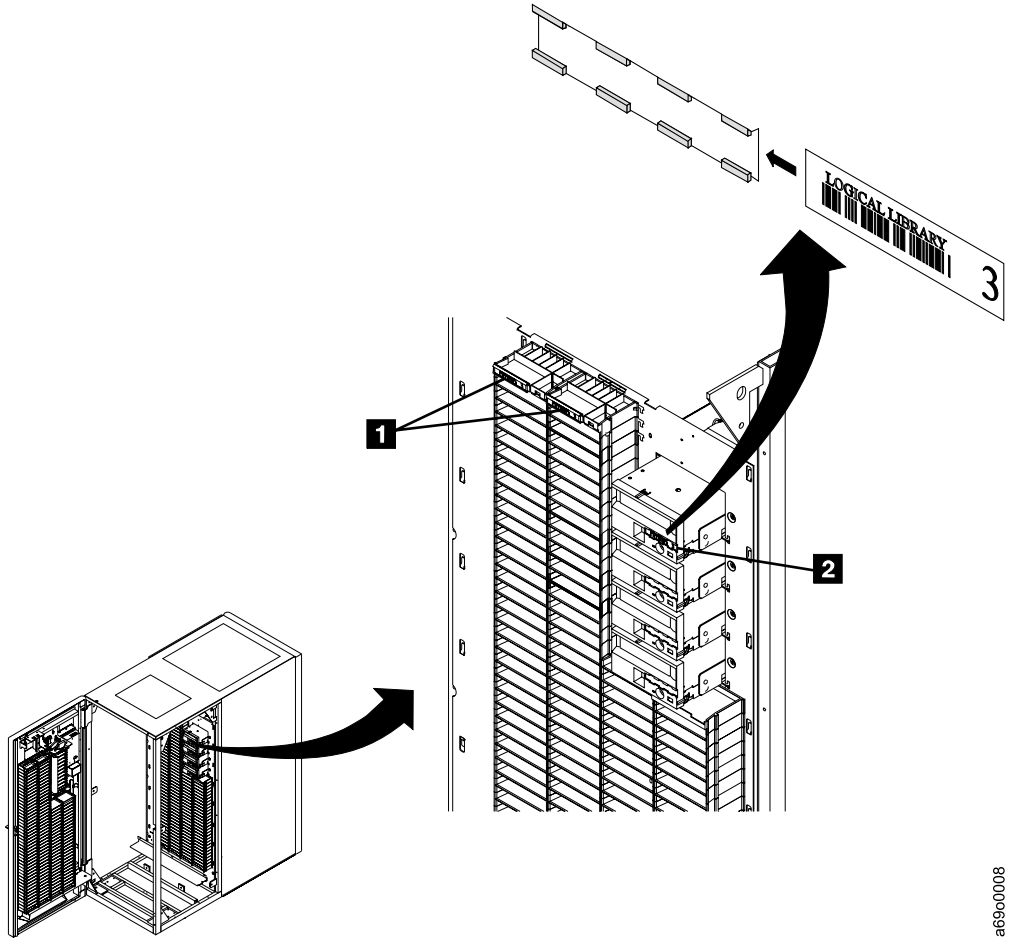

Figure 34. Attaching logical library bar code labels. Place the labels at the top of storage slot columns or drives.

Guidelines for Applying Labels: To indicate the boundaries of your logical library with labels, refer to Figure 35 on page 131 and use the following guidelines:

- If you mix drive types:
  - Ensure that your software application supports the intermixing of Ultrium 1 and Ultrium 2 tape drives and media in the same logical library. If it does not, configure the drives into separate logical libraries (which can still be within the same frame).
  - Configure LTO and DLT elements (drives and storage slots) into separate logical libraries.
- Regardless of whether you use mixed drive types, number your logical library labels sequentially and from left to right, beginning with Logical Library 1. Non-sequential labels are ignored for adjacent components. For example, if you label three adjacent columns as Logical Library 1, 4, and 5, all three columns will be in Logical Library 1.
- If you are transitioning from a DLT frame number `N` to an LTO frame number `N+1`, you must assign the first storage slot and tape drive in the LTO frame to logical library number `L+1` (where `L` is the last logical library number in the DLT frame). Likewise, when transitioning from an LTO frame number `N` to a DLT frame number `N+1`, you must assign the first storage slot and tape drive in the DLT frame to logical library number `L+1` (where `L` is the last logical library number in the LTO frame).
- If you require more than 10 logical libraries, you cannot use labels to partition. Instead, see “Configuring the Library by Using Menus” on page 132.
- Label only drive-side (odd-numbered) columns from left to right, beginning with Frame 1, Column 1. Label drives from top to bottom first, and then from left to right, beginning with Frame 1, Row 1.
- Designate the boundaries of your logical libraries. The UltraScalable Tape Library does not allow non-contiguous labels of the same logical library number. For example, if columns are labeled 1, 2, and 1, the third column will be considered part of Logical Library 2. See the examples in Figure 35 on page 131.
- All door-side (even-numbered) columns are not labeled for logical libraries. Instead, each is implicitly assigned to the same logical library as the drive-side (odd-numbered) column that it faces. For example, Column 6 is assigned to the same logical library as Column 5.
- If you use mixed drive types, ensure that the bar code labels for your logical libraries are placed correctly. A mislabeled logical library is assigned to the most recent valid logical library number (including an implicit number forced by a frame type transition). For example, if you label the boundaries of LTO/DLT/DLT/LTO as 1/1/2/1, the boundaries will be assigned to logical libraries 1/2/2/3, respectively (and the logical configuration process will fail if any of the three resulting logical libraries does not include at least one slot and one drive).
- No label is necessary for the control port. The library assigns the control port to the same logical library as the next drive in the sequence.

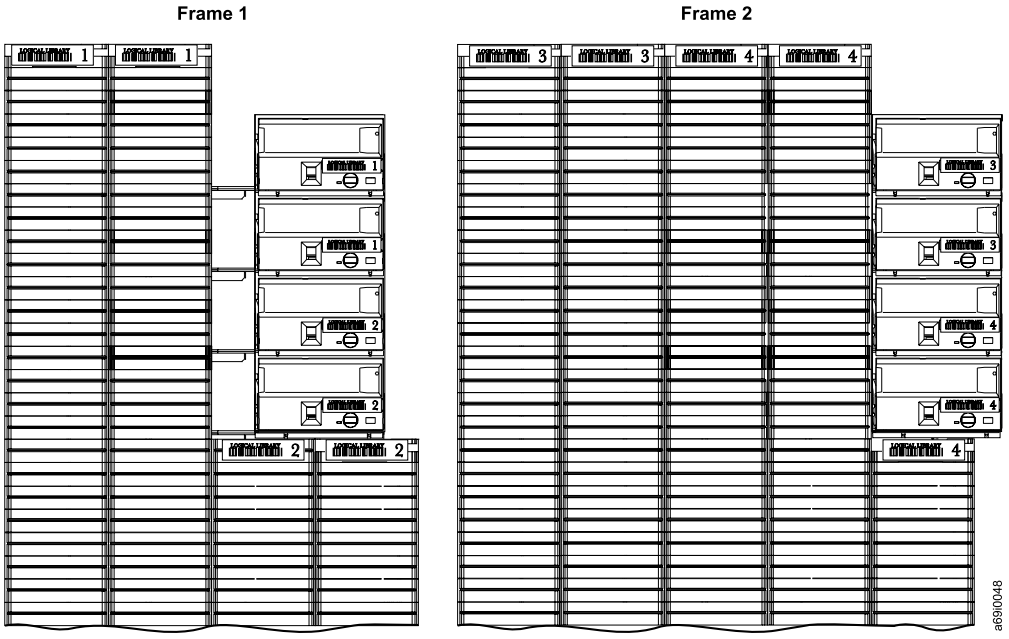

Figure 35. Indicating the boundaries of logical libraries

Configuring the Library by Using Menus

To configure your library by using menus, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Library Configuration** to view the current logical library configuration.
3. Select the Configuration Wizard link and follow the instructions on the screens until the Choose Configuration Method screen displays.
4. Select the Advanced configuration button and follow the instructions on the screens to specify one or more logical libraries and their attached physical devices (such as cartridge storage slots and drives), and to accept the configuration of the logical libraries.

   Note: If you have DLT and LTO media in your physical library, you will have more than one configuration range and more than one selection in the screens that follow (a configuration range includes all available contiguous drives and a single media type). For example, you can first configure a range of LTO elements, then a range of DLT elements.

From the Operator Panel

1. Determine the quantity of storage slots and tape drives that you want in each logical library (for the quantity of storage slots available per quantity of installed drives, see Appendix A, "Frame Capacity", on page 255).
2. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]          [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Configuration and press ENTER. The Configuration Menu displays.

```
Configuration Menu              Panel 0101

Display Configuration
Configure Library
Advanced Configure

[BACK]  [ UP ]          [ENTER]
```

5. Press UP or DOWN to highlight Advanced Configure and press ENTER. The library displays the message **If you continue with configuration the library will go offline. Press ENTER to continue.**
6. Press ENTER. The library displays the message **Ensure that any physical configuration changes have been completed before you continue.** If you want to add or remove drives or frames to your configuration, press BACK until you return to the Activity screen, then contact your IBM Service Representative to add or remove the hardware.
7. Press ENTER. The library displays the message **Searching for installed devices** and can take approximately 2 to 6 minutes to discover the physical configuration, depending on the number of frames. The Physical Configuration screen displays with the library's existing physical configuration. The screen shows the total quantity of drives, storage slots, and I/O slots in the library's physical configuration. For libraries that use both LTO and DLT media, the screen provides totals for each media type. It also shows the quantity of control ports (CPorts) for libraries that use DLT 8000 Tape Systems.

```
Physical Configuration          Panel 0102

Total Frames:             6
      Total LTO:          4
      Total DLT:          2

Total Drives:            48
      Total LTO:         36
      Total DLT:         12

Total Storage Slots:   2009
      Total LTO:       1363
      Total DLT:        646

Total I/O Slots:         28
    Total LTO:           10
    Total DLT:           18

Total CPorts:             6

Mode: Advanced Configure

[BACK]                 [DETAIL]   [ENTER]
```

8. Press ENTER. The library displays the message **Do you want to commit the new physical configuration?**

9. Press YES to accept the new physical configuration and to set up any logical library configurations. The Set Logical Libraries screen displays with the type of media to be used by the logical library. The screen also gives the numbers of the frames that the logical library spans.

```
Set Logical Libraries       Panel 0105

Media Type: LTO
Frame 1 - 1

Logical Libraries:  1

Select 1 - 12

[CANCEL]   [ UP ]   [ENTER]
```

10. Specify the quantity of logical libraries that you want by pressing UP or DOWN to increment or decrement the value (from 1 to whatever quantity of drives is installed in the library):
    - For libraries that use LTO media, the maximum number (quantity) of logical libraries is determined by the number of Ultrium drives that are installed in the library.
    - For libraries that use DLT media, the number of logical libraries is determined by the number of control ports in the library.

    When the desired quantity of libraries displays, press ENTER. The Set Storage Slots screen displays.

```
Set Storage Slots       Panel 0106

Logical Library 1

Storage Slots:  276

Select 1 - 281

[BACK]   [ UP ]   [DOWN]   [ENTER]
```

11. Specify the quantity of storage slots that you want in the logical library by pressing UP or DOWN to increment or decrement the value. When the desired quantity of storage slots displays, press ENTER.

    Note: If the quantity of storage slots that you specify changes the quantity of slots in an existing logical library and if this change moves the cartridges from one logical library to another, the library displays the message **Cartridges in the following storage slots will now be part of logical library x**, where x is the current logical library when the number is greater than previous, and x is the next highest logical library when the number is less than previous. The Set Drives screen displays.

```
Set Drives              Panel 0107

Logical Library 1

Number of Drives:  6

Select 1 - 6

[BACK]   [ UP ]   [DOWN]   [ENTER]
```

12. Specify the quantity of drives that you want in the logical library by pressing UP or DOWN to increment or decrement the value. When the desired quantity of drives displays, press ENTER. If applicable, the Set Storage Slots screen displays for you to configure the next logical library.
13. For each logical library that you specified in step 10 on page 134, repeat step 11 on page 134 and step 12 to add the storage slots and drives that you want (for the last logical library of each media type (LTO or DLT), the library automatically calculates the remaining storage slots and drives in the library).
14. Press ENTER. The Configuration Summary screen displays for Logical Library 1. The screen contains the range of SCSI element addresses for the cartridge storage slots and the drives. It also gives the location of the control path (the first drive in each logical library must be a control path).

    Note: Your application software may require you to write down the SCSI element addresses of the tape drives that are attached to that application. See Table 17 on page 122 for the physical location of each SCSI element address (referred to as a DTE address).

```
Configuration Summary       Panel 0103

Key: [F=Frame, C=Column, R=Row]


Logical Library 1
Media Type: LTO

Storage Slots:     0100
Elem Addr Range:   1025 - 1124
Location Start:    [F01,C01,R02]
Location End:      [F01,C06,R13]

Drives:            004
Elem Addr Range:   0257 - 0260
Location Start:    [F01,R01]
Location End:      [F01,R04]

Control paths:     002

[BACK]  [ENTER]
```

15. Press ENTER again to display the Configuration Summary screen for each logical library. After you display the Configuration Summary screen of the last logical library, press ENTER. The library displays the message **Do you want to commit the new logical configuration?**.
16. Press YES. The library displays the message **Writing new configuration to drives. This may take up to three minutes.**. When finished, it displays the message **The Configuration process is complete**.
17. Press ENTER to return to the Configuration screen.
18. Press BACK until you return to the Activity screen.

Displaying the SCSI ID or Loop ID of a Drive or Control Port

To display the SCSI IDs of tape drives that use LVD or HVD interfaces, the SCSI IDs of control ports, or the Loop IDs of Ultrium Tape Drives that use Fibre Channel interfaces, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Perform one of the following:
   - To display a tape drive's SCSI or Loop ID, select **Physical Library —> Drives**. The Drives screen displays the SCSI IDs of the Ultrium Tape Drives and DLT 8000 Tape Systems that use LVD or HVD interfaces, or it displays the Loop IDs of Ultrium Tape Drives that use Fibre Channel interfaces.
   - To display a control port's SCSI ID, select **Settings —> Control Port SCSI IDs**. The Control Ports screen displays the SCSI IDs of the control ports in the library.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight SCSI/Loop IDs, then press ENTER. The library displays the SCSI/Loop IDs screen.

```
SCSI/Loop IDs          Panel 0120

Display SCSI/Loop IDs
Change SCSI/Loop IDs

[BACK]          [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Display SCSI/Loop IDs and press ENTER. The Display SCSI/Loop IDs screen displays a list of the tape drives and control ports (Cports), with their physical locations and SCSI IDs.

```
Display SCSI/Loop IDs        Panel 0121

Key: [F=Frame, R=Row]

Drive [F01,R01]      SCSI ID   0
Drive [F01,R02]      Loop ID  18
Cport [F02,R00]      SCSI ID  13
Drive [F02,R01]      SCSI ID   0
Drive [F02,R02]      SCSI ID   1
Cport [F02,R03]      SCSI ID   2
Cport [F02,R04]      SCSI ID   3
Drive [F02,R05]      SCSI ID   4

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

   The locations of the drives or control ports are listed as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). To display more drives and control ports, highlight the bottom item and press DOWN. To return to the previous list of drives and control ports, highlight the top item and press UP.

5. Press BACK until you return to the Activity screen.

Changing the SCSI ID or Loop ID of a Drive or Control Port

The UltraScalable Tape Library assigns a default SCSI ID to each tape drive that uses an LVD or HVD interface, a SCSI ID to each control port, and a Loop ID to each Ultrium Tape Drive that uses a Fibre Channel interface. To change a SCSI ID or Loop ID, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Perform one of the following:
   - To change a tape drive's SCSI or Loop ID, select **Settings —> Drive SCSI/Loop IDs**. The Drives screen displays the SCSI IDs of the Ultrium Tape Drive and DLT 8000 Tape Systems that use LVD or HVD interfaces, or it displays the Loop IDs of Ultrium Tape Drive that use Fibre Channel interfaces.
   - To change a control port's SCSI ID, select **Settings —> Control Port SCSI IDs**. The Control Ports screen displays the SCSI IDs of the control ports in the library.
3. Locate the drive or control port that has the ID that you want to change and select the button to its left, then select the Change button. A drop-down list displays the available IDs.
4. Select the new ID, then select the Change button.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                 Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight SCSI/Loop IDs, then press ENTER. The library displays the SCSI/Loop IDs screen.

```
SCSI/Loop IDs           Panel 0120

Display SCSI/Loop IDs
Change SCSI/Loop IDs

[BACK]  [ UP ]          [ENTER]
```

4. Press UP or DOWN to highlight Change SCSI/Loop IDs and press ENTER. The Change SCSI/Loop IDs screen displays a list of the tape drives and control ports (Cports), with their physical locations and SCSI IDs.

```
Display SCSI/Loop IDs        Panel 0121

Key: [F=Frame, R=Row]

Drive [F01,R01]      SCSI ID   0
Drive [F01,R02]      Loop ID  18
Cport [F02,R00]      SCSI ID  13
Drive [F02,R01]      SCSI ID   0
Drive [F02,R02]      SCSI ID   1
Cport [F02,R03]      SCSI ID   2
Cport [F02,R04]      SCSI ID   3
Drive [F02,R05]      SCSI ID   4

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

The location of the drive or control port is listed as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). To display more drives or control ports, highlight the bottom item and press DOWN. To return to the previous list of drives or control ports, highlight the top item and press UP

5. Press UP or DOWN to highlight the drive or control port that you want to change and press ENTER. The library displays the message **Changing IDs will interrupt library and drive activities, and may require reconfiguration of host computers. Press ENTER to continue.** Press ENTER. The Change SCSI/Loop ID screen displays with one of two types of content:
   - If you selected an LTO Ultrium Tape Drive with a Fibre Channel interface, the screen gives the physical location of the selected drive and its current Loop ID.

```
Change SCSI/Loop ID     Panel 0122

Key: [F=Frame, R=Row]

Drive [F01,R02]  Loop ID [22]
                 AL_PA C6h

Press UP or DOWN to select a new
Loop ID, then press ENTER
to activate the change.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

- If you selected a SCSI drive or control port or an LTO Ultrium Tape Drive with a SCSI interface, the screen gives the physical location of the selected drive or control port and its current SCSI ID.

```
Change SCSI/Loop ID     Panel 0122

Key: [F=Frame, R=Row]

CPort [F02,R02]  SCSI ID [02]

Press UP or DOWN to select a new
SCSI ID, then press ENTER
to activate the change.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

6. Specify the number of the ID that you want to change by pressing UP or DOWN to increment or decrement the value. When the desired ID number displays, press ENTER. The message **Fibre Loop ID Change Complete** or **SCSI ID Change Complete** displays.

   Note: If you press CANCEL, no change will occur.
7. Press ENTER to return to the Display SCSI/Loop IDs screen.
8. Press BACK until you return to the Activity screen.

Displaying a World Wide Port Name

The UltraScalable Tape Library assigns a World Wide Port Name (WWPN) to each drive slot in the library. The WWPN does not change whenever a drive is swapped, replaced, or rebooted. Thus, if a drive needs service or replacement, host parameters do not need to be changed or reconfigured. In addition, the library's configuration can easily survive a reboot. To determine the WWPN for a drive, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> World Wide Names**. The World Wide Names screen displays with the port name of each drive that uses a Fibre Channel interface.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight World Wide Port Names, then press ENTER. The World Wide Port Names screen displays. For each configured Fibre Channel drive in Frame 1, the screen lists its physical location and World Wide Port Name. To display additional drives in Frame 1 or to display the drives in other frames, press DOWN. To return to previous screens, press UP.

```
World Wide Port Names                Panel 0125

Key: [F=Frame, R=Row]

[F01,R01]  5005 0763 0041 0001
[F01,R02]  5005 0763 0041 0002
[F01,R03]  5005 0763 0041 0003
[F01,R04]  5005 0763 0041 0004
[F01,R05]  5005 0763 0041 0005
[F01,R06]  5005 0763 0041 0006
[F01,R07]  5005 0763 0041 0007
[F01,R08]  5005 0763 0041 0008

[BACK]     [  UP  ]     [DOWN]
```

4. Press BACK until you return to the Activity screen.

Displaying a World Wide Node Name

Like the World Wide Port Name (see page (142), the World Wide Node Name (WWNN) is used as an identifier by the UltraScalable Tape Library for each Fibre Channel tape drive. To determine the World Wide Node Name for a drive, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> World Wide Names**. The World Wide Names screen displays with the node name of each drive that uses a Fibre Channel interface.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight World Wide Node Names, then press ENTER. The World Wide Node Names screen displays. For each configured Fibre Channel drive in Frame 1, the screen lists its physical location and World Wide Node Name. To display additional drives in Frame 1 or to display the drives in other frames, press DOWN. To return to previous screens, press UP.

```
World Wide Node Names                Panel 0126

Key: [F=Frame, R=Row]

[F01,R01]  5005 0763 0041 0001
[F01,R02]  5005 0763 0041 0002
[F01,R03]  5005 0763 0041 0003
[F01,R04]  5005 0763 0041 0004
[F01,R05]  5005 0763 0041 0005
[F01,R06]  5005 0763 0041 0006
[F01,R07]  5005 0763 0041 0007
[F01,R08]  5005 0763 0041 0008

[BACK]     [  UP  ]     [DOWN]
```

4. Press BACK until you return to the Activity screen.

Displaying Control Paths

The UltraScalable Tape Library has no direct SCSI connection to a server. Thus, when a server communicates with the library, it must send the communication via a control path to an Ultrium Tape Drive that is designated as LUN 1 or to a control port that is designated as LUN 0. A control path is a logical path into the library through which a server sends standard SCSI Medium Changer commands to control a specific logical library. When you add multiple control paths to the UltraScalable Tape Library, any single, configured logical library can be accessed by multiple servers. Additional control paths also reduce the possibility that failure in one control path will cause a loss in host communication for the entire library.

Note: Microsoft Windows 2000 Removable Storage Manager (RMS) does not support multiple control paths within a logical library.

To display control paths, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Control Paths**. The Control Paths screen shows where the control path (drive) for each logical library is located (which frame and row), and whether the control path is required, enabled, or disabled.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Control Paths, then press ENTER. The library displays the Control Paths screen.

```
Control Paths           Panel 0130

Display Control Paths
Change Control Paths

[BACK]          [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Display Control Paths, then press ENTER. The Control Paths screen displays a list of logical libraries, the drives in the logical libraries (and their physical locations), and whether the control paths for the drives are required, enabled, or disabled. If the library also uses DLT Tape Systems, the Control Paths screen lists the control paths (CPorts) in the logical libraries. For the first drive or any control port in the logical library the setting is always Required. Each logical library is represented as LLy, where y equals the number of the logical library. The locations of the drives or control ports are listed as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). To display more drives or control ports, highlight the bottom item and press DOWN. To return to the previous list of drives or control ports, highlight the top item and press UP.

```
Control Paths               Panel 0131

Key: [LL=Logical Library, F=Frame, R=Row]

LL001 Drive [F01,R01]    Required
LL001 Drive [F01,R02]    Disabled
LL002 CPort [F02,R00]    Required
LL003 Drive [F03,R01]    Required
LL003 Drive [F03,R02]    Disabled
LL003 Drive [F03,R03]    Disabled
LL004 CPort [F04,R00]    Required
LL005 Drive [F05,R01]    Required
LL005 Drive [F05,R02]    Disabled
LL005 Drive [F05,R03]    Disabled

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press BACK until you return to the Activity screen.

Changing a Control Path

Note: For an overview of control paths, see “Using Multiple Control Paths” on page 18.

To change a control path, use one of the following methods.

From the Web

To use the library’s UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Control Paths**. The Control Paths screen shows where the control path (drive) for each logical library is located (which frame and row), and whether the control path is required, enabled, or disabled.
3. Follow the instructions on the screens.

From the Operator Panel

1. From the library’s Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Control Paths, then press ENTER. The library displays the Control Paths screen.

```
Control Paths           Panel 0130

Display Control Paths
Change Control Paths

[BACK]  [ UP ]          [ENTER]
```

4. Press UP or DOWN to highlight Change Control Paths, then press ENTER. The Control Paths screen displays a list of logical libraries, the drives in the logical

libraries (and their physical locations), and whether the control paths for the drives are required, enabled, or disabled. If the library also uses DLT Tape Systems, the Control Paths screen lists the control paths (CPorts) in the logical libraries. For the first drive or any control port in the logical library the setting is always Required. Each logical library is represented as LLy, where y equals the number of the logical library. The locations of the drives or control ports are listed as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). To display more drives or control ports, highlight the bottom item and press DOWN. To return to the previous list of drives or control ports, highlight the top item and press UP.

```
Control Paths          Panel 0131

Key: [LL=Logical Library, F=Frame, R=Row]

LL001 Drive [F01,R01]    Required
LL001 Drive [F01,R02]    Disabled
LL002 CPort [F02,R00]    Required
LL003 Drive [F03,R01]    Required
LL003 Drive [F03,R02]    Disabled
LL003 Drive [F03,R03]    Disabled
LL004 CPort [F04,R00]    Required
LL005 Drive [F05,R01]    Required
LL005 Drive [F05,R02]    Disabled
LL005 Drive [F05,R03]    Disabled

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight the control path that you want to enable or disable, and press ENTER. The Control Path screen displays with the control path that you selected.

   Note: If you select a drive or control port that is a required control path, the library displays the message **This drive is a REQUIRED control path and cannot be changed.** Press ENTER to return to the previous screen.

```
Change Control Path     Panel 0132

Key: [LL=Logical Library, F=Frame, R=Row]

LL001 Drive [F01,R02]    ENABLED

Press UP or DOWN key to toggle the
Control Path setting, then press ENTER
to activate the change.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

6. Press UP or DOWN to specify ENABLED or DISABLED for the control path, then press ENTER. The Control Paths screen redisplays with the new setting.

   Note: The first time that the Change Control Path screen displays, the library displays the message **Changing Control Path settings will interrupt library and drive activities, and may require reconfiguration of host computers. Do you want to change Control Path settings?** Press YES to continue changing the control path (or press NO to return to the previous screen).

7. Press BACK until you return to the Activity screen.

Enabling or Disabling SNMP

Note: You can enable or disable the Simple Network Management Protocol (SNMP) through the library's operator panel but not through the UltraScalable Specialist web interface.

SNMP is a networking protocol that, when enabled, allows the library to automatically gather and transmit information about alerts and status to other entities in the network (such as an SNMP monitoring server). The information is called an SNMP trap.

After you enable SNMP, you can set the version that is supported by the SNMP monitoring server (see page 152), set the destination IP address of the trap (see page 154), then send the test trap (see page 156). While setting the parameters for the trap, you can optionally set the remote port and community name.

To enable or disable SNMP messaging, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                   Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network              Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                          Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight Enable/Disable SNMP and press ENTER. The Enable/Disable SNMP screen displays.

```
Enable/Disable SNMP           Panel 0166

SNMP is ENABLED

Press UP or DOWN to toggle the
SNMP setting, then press ENTER
to activate the change.

[BACK]  [DOWN]  [ENTER]
```

6. Press UP or DOWN to specify ENABLED or DISABLED for SNMP messaging, then press ENTER. The Enable/Disable SNMP screen redisplays the new setting. To accept the new setting and return to the previous screen, press BACK.
7. Press BACK until you return to the Activity screen.

Setting the Version of Traps

Note: You can set the version of SNMP traps by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

Some SNMP monitoring server's applications only support Version 1 SNMP traps, while others only support Version 2 traps (your SNMP operations staff will know the supported version). The UltraScalable Tape Library supports both Version 1 and Version 2c.

To set the version of SNMP traps that the library uses to communicate with an SNMP monitoring server's application, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                          Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight V1/V2 Traps and press ENTER. The V1/V2 Traps screen displays the version of the traps that were last sent by the SNMP agent.

```
V1/V2 Traps                Panel 0161

Trap Version is  [V2c]

Version 2 traps are not
supported by some SNMP
management stations.

Press UP or DOWN to toggle the
Trap setting, then press ENTER
to activate the change.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

   To send a different version of traps, press UP or DOWN to specify the version of the trap, then press ENTER. The screen redisplays with the new version of the trap.

6. Press BACK until you return to the Activity screen.

Viewing or Changing the Destination IP Addresses

Note: You can view or change the destination IP addresses by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

A destination IP (Internet protocol) address is the identifier of an SNMP monitoring server to which SNMP alerts will be sent. The address is unique to each monitoring server. It consists of an address that is assigned by your system administrator. The maximum quantity of monitoring servers and IP addresses per library is five.

To view or change the destination IP address, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network              Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                          Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight Destination IP Addresses and press ENTER. The Destination IP Addresses screen displays with the current destination IP address numbers (in this example, 1 through 5).

```
Destination IP Addresses       Panel 0170

Select Destination IP Address
to view/change.

IP Address:  2

Select 1 - 5

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

6. Press UP or DOWN to specify the destination IP address number that you want to view or change, then press ENTER. The Set Destination IP Address screen displays the current destination IP address that was assigned by your system administrator. The address is divided into four sets of characters separated by periods. Each set is called an octet.

```
Set Destination IP Address           Panel 0172

IP Address 2:  10.25.36.1

Use [UP] and [DOWN] to change
highlighted value.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

7. To change the first octet in the address, press UP or DOWN to change the value that you want, then press ENTER. The screen redisplays with the new characters and highlights the second octet. Press UP or DOWN to specify the numbers that you want, then press ENTER. Repeat this procedure for the third and fourth octets. After you modify the fourth octet, the screen redisplays with the entirely new destination IP address. To accept the new setting and return to the previous screen, press ENTER.

   Note: To disable an address, specify 0 for the first character. The library automatically enters zeroes for all characters and disables the address.

8. Press BACK until you return to the Activity screen.

Sending a Test SNMP Trap

Note: You can send a test SNMP tray by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

You can send a test SNMP trap to ensure that the library and the SNMP monitoring server's application are properly connected.

To send a test SNMP trap, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                        Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight Send a Test Trap and press ENTER. The library displays the message **A test trap with the text ″This is a test SNMP trap.″ has been sent to all defined target hosts. Press ENTER to continue.**
6. Press ENTER. The library sends an SNMP trap to all SNMP IP addresses at the remote port that you specified. The trap contains the machine type, model number, and serial number of the library, as well as other fields. For more information about SNMP traps, see “SNMP Messaging” on page 26. The SNMP menu displays.
7. Press BACK until you return to the Activity screen.

Viewing or Changing the Remote Port

Note: You can view or change the remote port by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

The library defaults to a remote port value of 162. For more information about the remote port, see the documentation for your monitoring station.

To view or change the remote port that is associated with the IP address, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                          Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

5. Press UP or DOWN to highlight Remote Port and press ENTER. The Remote Port screen displays the number of the port that is associated with one of the five destination IP addresses.

```
Remote Port             Panel 0168

Select Remote Port to view/change.

Remote Port:  1

Select 1-5

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

6. Perform one of the following:
   - To view the value of the remote port, press UP or DOWN to specify the associated number and press ENTER. The Set Remote Port screen displays with the value of the remote port. Press ENTER to return to the previous screen.
   - To change the value of the remote port, press UP or DOWN to specify the associated number and press ENTER. The Set Remote Port screen displays with the value of the remote port. Press UP or DOWN to increment or decrement the value. When the desired number displays, press ENTER. The library displays the message **Your Remote Port has been changed** and the Set Remote Port screen redisplays with the value of the remote port.

```
Set Remote Port          Panel 0169

Remote Port: [162]

Use UP or DOWN to change
highlighted value.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

7. Press BACK until you return to the Activity screen.

Viewing or Changing the Community Name

Note: You can view or change the community name by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

For information about the community name, see the documentation for your monitoring station.

To view or change the community name that is associated with the IP address, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight SNMP and press ENTER. The SNMP menu displays.

```
SNMP                          Panel 0165

Send a Test Trap
Enable/Disable SNMP
V1/V2 Traps
Destination IP Addresses
Remote Port
Community Name

[BACK]  [ UP ]  [ENTER]
```

5. Press UP or DOWN to highlight Community Name and press ENTER. The Community Name screen displays the current setting. The Community Name is a series of characters that both the library and the server must recognize to communicate.

```
Community Name              Panel 0167

Community Name:
public

Press UP/DOWN to change the
current character. ENTER
selects the next character.
ENTER on a blank commits
changes.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

   To change the password, press UP or DOWN to specify the character that you want and press ENTER. The screen highlights the next character. Continue to press UP or DOWN and ENTER to specify each character until you have typed the password (the maximum quantity of characters is 15). Press ENTER. The library displays the message **Community Name changed**. Press ENTER to return to the new SNMP screen.
6. Press BACK until you return to the Activity screen.

Viewing Ethernet Settings

Note: You can view Ethernet settings by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

To view the library's Ethernet settings, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Ethernet, then press ENTER. The Ethernet screen displays Ethernet settings for Frame 1. If the library contains more than one frame, press UP or DOWN to view the settings for the next or previous frame.

```
Ethernet               Panel 0175

Current Settings Frame 1:

MAC Address: 18:36:F3:98:4F:9A
IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Link State:  Connected
Speed:  100 Full duplex (Auto)

Setting: DHCP

INITIALIZING

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

The screen includes the following settings (though not all settings may display at the same time).

MAC Address
The Media Access Control (MAC) address is defined by the manufacturer of the Ethernet chip and cannot be changed.

IP Address
The Internet Protocol (IP) Address is an identifier that is unique to each library and is necessary for communication with the host server (it is different from the SNMP IP address).

Subnet Mask
The Subnet Mask address identifies the library's local area network (LAN).

Gateway
The Gateway Address is the location at which networks attach to each other. The link state indicates whether the Ethernet cable is properly connected to the library.

Link State
The Link State field indicates whether the Ethernet connection has been established between the library and the Ethernet switch. Values are Connected or Not Connected.

Speed The Speed field indicates the speed of data transmission across the Ethernet network. Valid values are:

- Set Speed to Auto Negotiate (the speed was negotiated automatically by the hardware (at 10 half duplex), rather than by a user).
- Set Speed to 100 Full Duplex (the data is communicated at 100 Mb/s with simultaneous sending and receiving capability)
- Set Speed to 100 Half Duplex (the data is communicated at 100 Mb/s with sending or receiving capability)
- Set Speed to 10 Full Duplex (the data is communicated at 10 Mb/s with simultaneous sending and receiving capability)
- Set Speed to 10 Half Duplex (the data is communicated at 100 Mb/s with sending or receiving capability)

Setting

The Setting field indicates whether the Dynamic Host Configuration Protocol (DHCP) lets another machine assign the library a Destination IP Address, or whether you assigned the address manually. Values are DHCP or Manual IP Entry

`[Change Settings]/INITIALIZING` displays when you cycle power and the Ethernet driver boots. INITIALIZING also displays when you reset an Medium Changer Pack (MCP) card.

5. Press BACK until you return to the Activity screen.

Changing the Ethernet Address Settings

Note: You can change Ethernet address settings by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

You can disable Ethernet settings, manually enable them, or let another machine enable them by using DHCP. You can also set a specific speed for the Ethernet port or specify the library to automatically negotiate the speed.

To change the library's Ethernet address settings, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Ethernet, then press ENTER. The Ethernet screen displays Ethernet settings for Frame 1 (for an explanation of the fields in the Ethernet screen, see page 163). If the library contains more than one frame, press UP or DOWN to view the settings for the next or previous frame.

```
Ethernet               Panel 0175

Current Settings Frame 1:

MAC Address: 18:36:F3:98:4F:9A
IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Link State:  Connected
Speed:  100 Full duplex (Auto)

Setting: DHCP

[Change Settings]

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

5. To change the Ethernet address settings, press ENTER. The Ethernet Settings menu displays.

```
Ethernet Settings          Panel 0176

Disable Ethernet
Enable with DHCP
Enable with Manual IP Entry
Set Speed to Auto Negotiate
Set Speed to 100 Full Duplex
Set Speed to 100 Half Duplex
Set Speed to 10 Full Duplex
Set Speed to 10 Half Duplex

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

6. Press UP or DOWN to highlight Enable with Manual IP Entry and press ENTER. The Manual Ethernet Settings screen displays.

```
Manual Ethernet Settings       Panel 0177

IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Use UP or DOWN to change
highlighted value.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

   To change the first octet in the IP Address, press UP or DOWN to change the value that you want, then press ENTER. The screen redisplays with the new characters and highlights the second octet. Press UP or DOWN to specify the numbers that you want, then press ENTER. Repeat this procedure for the third and fourth octets. After you modify the fourth octet and press ENTER, the library highlights the first octet of the Subnet Mask. Continue to change numbers as necessary. When you press ENTER after the last octet in Gateway, the library displays the message **Updating. This may take up to four minutes.** followed by **Ethernet Settings updated**.

7. Press ENTER. The Ethernet screen redisplays with the new settings.
8. Press BACK until you return to the Activity screen.

Changing the Speed of the Ethernet Link

Note: You can change the speed of the Ethernet link by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

You can specify that data be transmitted across the Ethernet network at a specified rate or you indicate that the library automatically negotiate that rate. The rates of transmission are 100 Mb/sec at full duplex, 100 Mb/sec at half duplex, 10 Mb/sec at full duplex, and 10 Mb/sec at half duplex.

To change the speed of the library's Ethernet port, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Ethernet, then press ENTER. The Ethernet screen displays Ethernet settings for Frame 1 (for an explanation of the fields in the Ethernet screen, see page 163). If the library contains more than one frame, press UP or DOWN to view the settings for the next or previous frame.

```
Ethernet               Panel 0175

Current Settings Frame 1:

MAC Address: 18:36:F3:98:4F:9A
IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Link State:  Connected
Speed:  100 Full duplex (Auto)

Setting: DHCP

[Change Settings]

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

5. To change the speed of the Ethernet link, press ENTER. The Ethernet Settings menu displays.

```
Ethernet Settings          Panel 0176

Disable Ethernet
Enable with DHCP
Enable with Manual IP Entry
Set Speed to Auto Negotiate
Set Speed to 100 Full Duplex
Set Speed to 100 Half Duplex
Set Speed to 10 Full Duplex
Set Speed to 10 Half Duplex

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

6. Press UP or DOWN to highlight the speed that you want, then press ENTER. The message **Updating Ethernet Settings this may take up to four minutes** displays, and the change begins. When the new setting is in place, **Ethernet Settings Updated** displays.
7. Press ENTER. The Ethernet menu redisplays with the new setting.
8. Press BACK until you return to the Activity screen.

Using DHCP Server Settings

Note: You can use the DHCP server settings by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

The Dynamic Host Configuration Protocol (DHCP) server acts as an administrator for the network. If you do not assign an IP address for the library, the DHCP can assign it.

To specify that the DHCP server assign an IP address, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Ethernet, then press ENTER. The Ethernet screen displays Ethernet settings for Frame 1 (for an explanation of the fields in the Ethernet screen, see page 163). If the library contains more than one frame, press UP or DOWN to view the settings for the next or previous frame.

```
Ethernet               Panel 0175

Current Settings Frame 1:

MAC Address: 18:36:F3:98:4F:9A
IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Link State:  Connected
Speed:  100 Full duplex (Auto)

Setting: Manual IP Entry

[Change Settings]

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

5. To change the Ethernet setting, press ENTER. The Ethernet Settings menu displays.

```
Ethernet Settings          Panel 0176

Disable Ethernet
Enable with DHCP
Enable with Manual IP Entry
Set Speed to Auto Negotiate
Set Speed to 100 Full Duplex
Set Speed to 100 Half Duplex
Set Speed to 10 Full Duplex
Set Speed to 10 Half Duplex

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

6. Press UP or DOWN to highlight Enable with DHCP and press ENTER. The library displays the message **If you select ENTER, the Ethernet Settings will be obtained through the DHCP server. Press ENTER to continue.** Press ENTER to obtain the settings. The library displays the message **Enabling DHCP settings. This may take up to four minutes.** followed by **DHCP Enabled**. Press ENTER. The Ethernet menu redisplays with the new setting.
7. Press BACK until you return to the Activity screen.

Disabling Ethernet

Note: You can disable Ethernet by using the library's operator panel, but not by using the UltraScalable Specialist web interface.

To disable Ethernet, use the following method.

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Network, then press ENTER. The Network menu displays with a list of network options that you can view or change.

```
Network             Panel 0160

SNMP
Ethernet
Web Server

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Ethernet, then press ENTER. The Ethernet screen displays Ethernet settings for Frame 1 (for an explanation of the fields in the Ethernet screen, see page 163). If the library contains more than one frame, press UP or DOWN to view the settings for the next or previous frame.

```
Ethernet               Panel 0175

Current Settings Frame 1:

MAC Address: 18:36:F3:98:4F:9A
IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

Link State:  Connected
Speed:  100 Full duplex (Auto)

Setting: DHCP

[Change Settings]

[BACK]  [ UP ]   [ENTER]
```

5. To change the Ethernet setting, press ENTER. The Ethernet Settings menu displays.

```
Ethernet Settings          Panel 0176

Disable Ethernet
Enable with DHCP
Enable with Manual IP Entry
Set Speed to Auto Negotiate
Set Speed to 100 Full Duplex
Set Speed to 100 Half Duplex
Set Speed to 10 Full Duplex
Set Speed to 10 Half Duplex

[BACK]   [DOWN]   [ENTER]
```

6. Press UP or DOWN to highlight Disable Ethernet and press ENTER. The library displays the message **If you select ENTER, the Ethernet Settings will be disabled. Press ENTER to continue.** Press ENTER to disable the settings. The library displays the message **Disabling Ethernet. This may take up to four minutes.** followed by **Ethernet Disabled**.
7. Press ENTER. The Ethernet menu redisplays with the new setting.
8. Press BACK until you return to the Activity screen.

Changing the Date and Time

To change the date and time settings on your UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Date and Time**. The Date and Time screen displays.
3. Follow the instructions on the screen.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Date/Time, then press ENTER. The Date/Time menu displays with the current date and time. It also includes a list of parameters that you can change. They include the minute, hour, day, month, and year.

```
Date/Time              Panel 0140

Current Date/Time:

Mar 1, 2001 17:00:00

Change Minute
Change Hour
Change Day
Change Month
Change Year

[BACK]          [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight the parameter that you want to change and press ENTER. Depending on the parameter that you chose, a screen similar to the following displays.

```
Set Minute             Panel 0141

Mar 1, 2001 17:00:00

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

5. Press UP or DOWN to increment or decrement the minute, hour, day, month, or year setting.
6. Press ENTER to redisplay the screen with the new setting.
7. Press BACK until you return to the Activity screen.

Enabling or Disabling the Keypress Beep

Note: Not implemented in the UltraScalable Specialist web interface.

The UltraScalable Tape Library uses a beep to acknowledge that you pressed a touch key on the touchscreen LCD. Use the following steps to enable or disable the keypress beep:

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Sounds, then press ENTER. The Sounds screen displays with the current setting of the beep.

```
Sounds                   Panel 0155

Keypress Beep is ENABLED

Disable Beep

[BACK]  [ENTER]
```

4. Press ENTER to change the setting of the beep to DISABLED or ENABLED. The library displays the message **You are about to set Keypress Beep Mode to x. Do you want to continue?** (where x equals DISABLED or ENABLED).
5. Press YES. The Sounds screen redisplays with the new setting.
6. Press BACK until you return to the Activity screen.

Enabling or Disabling Insert Notification

The UltraScalable Tape Library offers an Insert Notification option that monitors the library for new media and asks you to assign the media to a logical library. This can occur if you open the door of the I/O station and place a cartridge into an empty I/O slot or move a cartridge from one I/O slot to another.

When the Insert Notification setting is enabled, unassigned cartridges are inaccessible to any logical library, but user interfaces are still able to move cartridges to logical libraries and make them accessible to the host.

To enable or disable the Insert Notification option, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Settings —> Insert Notification**. The Change Insert Notification screen displays.
3. Follow the instructions on the screen.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Settings, then press ENTER. The Settings menu displays.

```
Settings                  Panel 0100

Configuration
Cleaning Mode
SCSI/Loop IDs
World Wide Port Names
World Wide Node Names
Control Paths
Network
Date/Time
Sounds
Insert Notification

[BACK]  [ UP ]          [ENTER]
```

3. Press UP or DOWN to highlight Insert Notification, then press ENTER. The Change Insert Notification screen displays. If the option is enabled, the screen prompts you for a logical library and identifies the new cartridges to the server.

```
Change Insert Notification            Panel 0190

Insert Notification: ENABLED

Insert Notification will prompt
for a logical library when the I/O
station door is opened. New cartridges
in the I/O will be assigned to the
selected logical library.

Press [UP] or [DOWN] to change the
Insert Notification setting, then
press [ENTER] to activate the
changes.


[BACK]   [ UP ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to specify whether you want to enable or disable the setting, then press ENTER. A confirmation screen displays.
5. If the new setting is correct, press ENTER. The screen redisplays with the new setting.
6. Press BACK until you return to the Activity screen.

Determining Usage

This section describes how to determine usage for the accessor, drive, or cleaning cartridge.

Determining Accessor Usage

To determine usage information about the cartridge accessor, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> Accessor**. The Accessor screen displays statistics about the accessor's usage.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Usage Statistics, then press ENTER. The Usage menu displays.

```
Usage                   Panel 0200

Accessor Usage
Drive Usage
Cleaning Cartridge Usage

[BACK]          [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Accessor Usage, then press ENTER. The Accessor Usage screen displays. The screen lists how many pivots of the accessor, picks and puts for each gripper, and bar code scans have occurred. It also lists how many meters the accessor has traveled on the X and Y axes.

```
Accessor Usage     Panel 0201

Accessor A:

  Pivots:           0000002
  Gripper 1
    Gets:           0000001
    Puts:           0000001
  Gripper 2
    Gets:           0000001
    Puts:           0000001
Scans:              0000003
X Dist.(m)          0000010
Y Dist.(m)          0000005

[BACK]   [UP]   [DOWN]
```

4. Press BACK until you return to the Activity screen.

Determining Drive Usage

To determine usage information about a drive in the UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> Drives**. The Drives screen displays.
3. Select the drive that you want.
4. Select the Drive Usage button for usage statistics.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Usage Statistics, then press ENTER. The Usage menu displays.

```
Usage                      Panel 0200

Accessor Usage
Drive Usage
Cleaning Cartridge Usage

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Drive Usage, then press ENTER. The Select Drive screen displays with a list of drives in the library and their physical locations. The locations are listed as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). To display more drives, highlight the bottom item and press DOWN. To return to the previous list of drives, highlight the top item and press UP.

```
Select Drive          Panel 0210

Key: [F=Frame, R=Row] L=LTO Ultrium

Drive [F01,R01]   L1
Drive [F01,R02]   L1
Drive [F01,R03]   L1
Drive [F01,R04]   L1
Drive [F01,R05]   L1
Drive [F01,R06]   L1
Drive [F01,R07]   L2
Drive [F01,R08]   L2
Drive [F01,R09]   L2
Drive [F01,R10]   L2

[BACK]  [ UP ]  [DOWN]   [ENTER]
```

4. Press UP or DOWN to highlight the drive that you want to review and press ENTER. Another Drive Usage screen displays with data about the drive that you chose. Because the library and the drive each track statistics for the drive independently, the screen contains two sections of statistics. If a drive is exchanged, however, the load and unload statistics tracked by the drive will be different than the statistics tracked by the library. Additional data on the screen includes information about how many times tape cartridges have been loaded into and unloaded from the drive, how many megabytes of data the drive has written and read (represented as `MB Written` and `MB Read`), and how many cleanings the drive has had (`MB Written`, `MB Read`, and `Unloads` are not available for DLT Tape Systems). The location of the drive is listed as `[Fx,Rzz]`, (where `F` equals frame and `x` equals its number, and `R` equals row and `zz` equals its number).

```
Drive Usage          Panel 0211

Key: [F=Frame, R=Row]

Drive  [F01, R01]   Media Type: LTO

Library Statistics

  Loads:                   0003024
  Unloads:                 0003024

Drive Statistics

  Loads:                   0000001
  Unloads:                 0000001
  MB Written:              0000001
  MB Read:                 0000002
  Cleanings:               0000000

[BACK]  [ UP ]  [DOWN]
```

Note: If the drive replaced a drive that was removed for service, its load and unload statistics may be lower than those of the library.

5. Press BACK until you return to the Activity screen.

Determining Cleaning Cartridge Usage

To determine how many times the cleaning cartridge has been used, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Physical Library —> Cleaning Cartridges**. The Cleaning Cartridges screen displays a list of all cleaning cartridges in the library and their usage statistics.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Usage Statistics, then press ENTER. The Usage menu displays.

```
Usage                       Panel 0200

Accessor Usage
Drive Usage
Cleaning Cartridge Usage

[BACK]  [ UP ]   [ENTER]
```

3. Press UP or DOWN to highlight Cleaning Cartridge Usage, then press ENTER. The Cleaning Cartridge Usage screen displays with a list of the cleaning cartridges in the UltraScalable Tape Library and how many times they have been used. For libraries that use both LTO and DLT media, the screen also indicates whether the cartridge is an LTO cartridge or DLT cartridge. To display more cleaning cartridges, highlight the bottom item and press DOWN. To return to the previous list of cleaning cartridges, highlight the top item and press UP.

```
Select Cleaning Cartridge        Panel 0220

CLN001      020     DLT
CLNI02L1    020     LTO
CLNI03L1    015     LTO
CLNI04L1    010     LTO
CLN005      005     DLT
CLN006      000     DLT
CLNI07L1    000     LTO
CLN008      000     DLT
CLN009      000     DLT
CLNU10L1    000     LTO

[BACK]  [ UP ]  [DOWN]
```

4. Press BACK until you return to the Activity screen.

Accessing Vital Product Data

This section describes how to access vital product data (VPD) for the library, drive, node cards or control ports.

Accessing Library VPD

VPD for the UltraScalable Tape Library includes the machine types, model numbers, and serial numbers of its frames, as well as the type of media each frame uses. To determine VPD for the library, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Library VPD**. The Vital Product Data screen displays the machine type, model number, and serial numbers of each frame, as well as the type of media each frame uses.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Vital Product Data, then press ENTER. The Vital Product Data menu displays.

```
Vital Product Data             Panel 0300

Library VPD
Drive VPD
Node Card VPD
Control Port VPD

[BACK]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Library VPD, then press ENTER. The Library VPD screen displays. The screen lists the machine type, model number, and serial number for Frame 1. For libraries that use both LTO and DLT media, the Media Type field indicates the type of media used in the frame. To display the VPD for additional frames (if applicable), press DOWN. To return to a previous screen, press UP.

```
Library VPD             Panel 0301

Frame 1

  Machine Type:     3584
  Model:            L32
  Serial:           1300001
  Media Type:       LTO

[BACK]  [ UP ]  [DOWN]
```

4. Press BACK until you return to the Activity screen.

Accessing Drive VPD

The VPD for an Ultrium Tape Drive includes the physical location of the drive, the SCSI Inquiry identification, and the version of firmware loaded. To determine VPD for a drive, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Drive VPD**. The Vital Product Data screen displays the location, SCSI Inquiry identification (drive type), and version of firmware for each drive.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu              Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Vital Product Data, then press ENTER. The Vital Product Data menu displays.

```
Vital Product Data            Panel 0300

Library VPD
Drive VPD
Node Card VPD
Control Port VPD

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Drive VPD, then press ENTER. The Drive VPD screen displays. For each configured drive in Frame 1, the screen lists the physical location of the drive and its SCSI Inquiry identification (such as ULT3580-TD1 for Ultrium 1 Tape Drives, ULT3580-TD2 for Ultrium 2 Tape Drives, and DLT8000 for DLT 8000 Tape Systems). It also gives the version of firmware loaded on each drive and whether the drive uses a SCSI LVD, SCSI HVD, or Fibre Channel (FC) interface. To display additional drives for Frame 1 and the VPD for the drives in other frames, press DOWN. To return to previous screens, press UP.

```
Drive VPD               Panel 0310

Key: [F=Frame, R=Row]

[F01,R01] ULT3580-TD1 1234 LVD
[F01,R02] ULT3580-TD1 1234 LVD
[F01,R03] ULT3580-TD1 1234 LVD
[F01,R04] ULT3580-TD1 1234 FC
[F01,R05] ULT3580-TD1 1234 FC
[F01,R06] ULT3580-TD1 1234 FC
[F01,R07] ULT3580-TD2 1234 FC
[F01,R08] ULT3580-TD1 1234 HVD

[BACK]  [ UP ]  [DOWN]
```

4. Press BACK until you return to the Activity screen.

Accessing Node Card VPD

Node cards are the four circuit boards (accessor controller card, motor driver assembly, Medium Changer card pack (MCP), and operator panel assembly) that communicate with each other over the Controller Area Network (CAN) bus.

The VPD for the node cards includes the part number and serial number of the card, as well as the version of firmware loaded and the number of the frame in which the card is located. To determine VPD for a node card, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Node Card VPD**. The Vital Product Data screen displays the location of the library's node cards and version of their software.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Vital Product Data, then press ENTER. The Vital Product Data menu displays.

```
Vital Product Data             Panel 0300

Library VPD
Drive VPD
Node Card VPD
Control Port VPD

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Node Card VPD, then press ENTER. The Node Card VPD screen displays for Frame 1. The screen shows the part number and serial number of the accessor controller card, as well as the level of firmware in the library.

```
Node Card VPD            Panel 0320

Frame 1:
 Accessor Controller Card

  Part Number:       1234567
  Serial Number:     YN100002W123
  Firmware Version:  3060

[BACK]  [ UP ]  [DOWN]
```

   To view VPD for the motor driver assembly, Medium Changer card pack, and operator panel assembly in Frame 1, press UP. Continue to press UP to view the VPD for node cards in other frames. To return to previous screens, press UP.

   Note: If the MCP node card is enabled for web use, the same screen displays but includes the version of the web (see the screen that follows). If `Mismatch` displays in the Web Version field, the web and the code card versions are not the same code versions. To access the web pages, reload the firmware or contact your IBM Service Representative.

```
Node Card VPD            Panel 0320

Frame 1:
 Accessor Controller Card

  Part Number:       1234567
  Serial Number:     YN100002W123
  Firmware Version:  3060
  Web Version:       3060

[BACK]  [ UP ]  [DOWN]
```

4. Press BACK until you return to the Activity screen.

Accessing Control Port VPD

Located at the left rear of a Model D42 frame, a control port is a hardware unit through which library SCSI commands and SCSI status pass between a DLT 8000 Tape System and a server.

The VPD for a control port includes its location and version of firmware. To determine VPD for a control port, use one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Control Port VPD**. The Vital Product Data screen displays the location and version of firmware for each control port.

From the Operator Panel

1. From the library's Activity screen, press MENU. The Main Menu displays.

```
Main Menu               Panel 0002

Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

2. Press UP or DOWN to highlight Vital Product Data, then press ENTER. The Vital Product Data menu displays.

```
Vital Product Data             Panel 0300

Library VPD
Drive VPD
Node Card VPD
Control Port VPD

[BACK]  [ UP ]   [ENTER]
```

3. Press UP or DOWN to highlight Control Port VPD, then press ENTER. The Control Port VPD screen displays for control port (CPort) in Frame 1, Row 00.

```
Control Port VPD            Panel 0330

Key: [F=Frame, R=Row]

CPort [F02,R00]

  Firmware Version:  164G

[BACK]  [ UP ]  [DOWN]
```

The screen gives the location of the control port as [Fx,Rzz], (where F equals frame and x equals its number, and R equals row and zz equals its number). It also shows the version of firmware that is currently loaded.

4. To view VPD for control ports in other frames, press DOWN. To return to previous screens, press UP.
5. Press BACK until you return to the Activity screen.

Accessing Library Logs

Note: You can access library logs by using the UltraScalable Specialist web interface but not by using the library's operator panel.

To access logs for the library, use the following method:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Introduction screen displays.
2. Select **Service —> Download Logs**. The Download Logs screen displays.
3. From the drop-down box, select Library Logs.
4. Follow the instructions on the screen.

Accessing Drive Logs

Notes:

1. You can access drive logs by using the UltraScalable Specialist web interface but not by using the library's operator panel.
2. This procedure is not available for DLT 8000 Tape Systems.

To access logs for the Ultrium Tape Drives, use the following method:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Introduction screen displays.
2. Ensure that the drive that you want to access is not in operation (that is, no host applications are using the drive). If the drive is operating and you attempt to download its logs, a drive error will occur.
3. Select **Service —> Download Logs**. The Download Logs screen displays.
4. From the drop-down box, select Drive Logs.
5. Follow the instructions on the screen.

Accessing Control Port Logs

Note: You can access control port logs by using the UltraScalable Specialist web interface but not by using the library's operator panel.

To access control port logs, use the following method:

1. Type the Ethernet IP address or the library URL on the URL line and press Enter. The Introduction screen displays.
2. Ensure that the drive that you want to access is not in operation (that is, no host applications are using the drive). If the drive is operating and you attempt to download its logs, a drive error will occur.
3. Select **Service —> Download Logs**. The Download Logs screen displays.
4. From the drop-down box, select Control Port Logs.
5. Follow the instructions on the screen.

Updating Library Firmware

To update the firmware for the UltraScalable Tape Library, use one of the following methods.

Note: When updating firmware, ensure that the device that you are updating (library, drive, or control port) is not in use at the time of the update.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Firmware Update**. The Firmware Update screen displays.
3. Follow the instructions on the screen to identify, download (from the Internet), and install the current firmware image for the library.

From the Host by Using a Device Driver

To update the library firmware from the host by using a device driver, refer to the instructions in the *IBM Ultrium Device Drivers Installation and User's Guide*.

Other Methods

Other methods exist for updating library firmware. For more information, contact your IBM Service Representative.

Updating Drive Firmware

You can copy firmware for like drive types from one drive to another.

To update the firmware for DLT 8000 Tape Systems, contact your IBM Service Representative. To update firmware for Ultrium Tape Drives, use the one of the following methods.

From the Web

To use the library's UltraScalable Specialist web interface, perform the following steps:

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Firmware Update**. The Firmware Update screen displays.
3. Follow the instructions on the screen to identify, download, and install the current firmware image for the Ultrium Tape Drives.

From the Host by Using a Device Driver

To update drive firmware from the host by using a device driver, refer to the instructions in the *IBM Ultrium Device Drivers Installation and User's Guide*.

Other Methods

Other methods exist for updating drive firmware. For more information, contact your IBM Service Representative.

Updating DLT Control Port Firmware

Note: When updating firmware, ensure that the device that you are updating (library, drive, or control port) is not in use at the time of the update.

To update the firmware for a DLT control port by using the library's UltraScalable Specialist web interface, perform the following steps.

1. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
2. Select **Service —> Firmware Update**. The Firmware Update screen displays.
3. Follow the instructions on the screen to identify, download, and install the current firmware image for the DLT control port.

Performing a Remote Drive Power Cycle

Note: This function is available only through the UltraScalable Specialist web interface; it is not available through the operator panel.

On occasion, a drive may experience an error. Errors are represented by the message `Not Responding` and by error indicators in the Status column of the Drives screen. For intermittent, non-hardware problems (such as a drive hang), you can use the UltraScalable Specialist web interface to cycle power to the drive (turn it off, then on) from a remote location. The remote power cycle feature resets the drive.

To perform a remote power cycle, use the following steps:

1. Ensure that the drive to which you want to apply the power cycle is not currently operating (if you cycle power to a drive that contains a cartridge, the rewind time may be of extended duration).
2. Type the Ethernet IP address on the URL line of the browser and press Enter. The Home screen displays.
3. Select **Physical Library —> Drives** (or **Logical Library —> Drives**). The Drives screen displays.
4. Select the drive that you want, then select Power Cycle:
   - If password protection is disabled, the drive performs the remote power cycle.
   - If password protection is enabled, the UltraScalable Specialist prompts you for an administrator userid and password, then performs the remote power cycle. The message `Initializing` displays and the error indicator is removed.
   - Select Refresh to redisplay the Drives screen and to return the status to Online.

Chapter 5. Using Ultrium Media

The IBM TotalStorage UltraScalable Tape Library 3584 automates the storage and movement of IBM LTO Ultrium Tape Cartridges. Within the library, the Ultrium Tape Drives use the following cartridge types:

- IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
- IBM LTO Ultrium Data Cartridge (Ultrium 1)
- IBM TotalStorage LTO Ultrium Cleaning Cartridge
- LTO Ultrium Cleaning Cartridge
- Diagnostic cartridge

The Ultrium 2 Tape Drive is compatible with the cartridges of its predecessor, the Ultrium 1 Tape Drive. When labeled according to proper IBM bar code label specifications (see “Bar Code Label” on page 200), the last character of the cartridge’s volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge. Cartridge compatibility for the Ultrium 2 Tape Drive is as follows:

- Reads and writes Ultrium 2 format on Ultrium 2 cartridges
- Reads and writes Ultrium 1 format on Ultrium 1 cartridges
- Does not write Ultrium 2 format on Ultrium 1 cartridges
- Does not write Ultrium 1 format on Ultrium 2 cartridges

Figure 36 shows the IBM TotalStorage LTO Ultrium 200 GB Data Cartridge and its components.

1	LTO cartridge memory	4	Write-protect switch
2	Cartridge door	5	Label area
3	Leader pin	6	Insertion guide

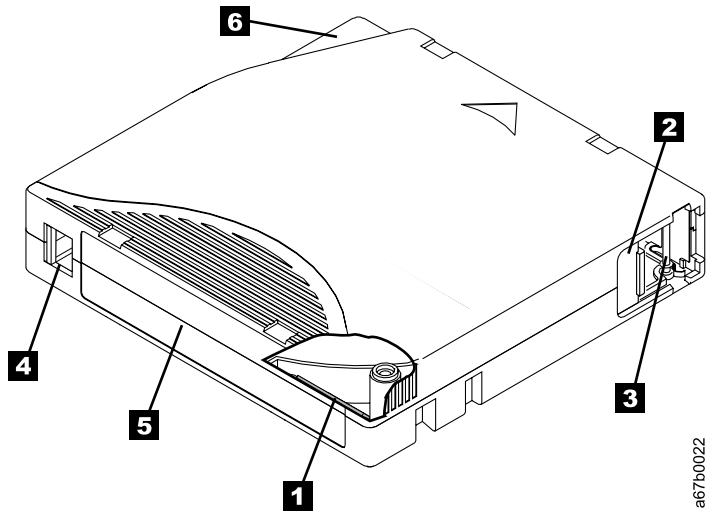

Figure 36. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge

In addition to using LTO Ultrium 2 Tape Cartridges with up to 200 GB capacity, the tape drive reads and writes to certified LTO Ultrium Tape Cartridges that have capacities of 100, 50, 30, and 10 GB. If you want to control the capacity of the cartridge (for example, if you want to limit the capacity to obtain a faster seek time) you can do so by issuing the SCSI command SET CAPACITY. For information about this command, refer to the *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*.

To ensure that your tape drive conforms to IBM's specifications for reliability, use only IBM LTO Ultrium Tape Cartridges. You may use other LTO-certified data cartridges, but they may not meet the standards of reliability that are established by IBM. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge cannot be interchanged with the media used in other IBM non-LTO Ultrium tape products.

Data Cartridge

The IBM Ultrium 2 Data Cartridge is purple, and the Ultrium 1 Data Cartridge is black. Both generations contain 1/2-inch, dual-coat, metal-particle tape. The Ultrium 1 cartridge has a native data capacity of 100 GB (200 GB at 2:1 compression); the Ultrium 2 cartridge has a native data capacity of 200 GB (400 GB at 2:1 compression).

When processing tape in the cartridges, the Ultrium Tape Drives use a linear, serpentine recording format. The Ultrium 1 drive reads and writes data on 384 tracks, eight tracks at a time; the Ultrium 2 drive reads and writes data on 512 tracks, eight tracks at a time The first set of eight tracks is written from near the beginning of the tape to near the end of the tape. The head then repositions to the next set of eight tracks for the return pass. This process continues until all tracks are written and the tape is full, or until all data is written.

Both generations of the IBM LTO Ultrium Data Cartridges include a Linear Tape-Open Cartridge Memory (LTO-CM) chip (**1** in Figure 36 on page 197), that contains information about the cartridge and the tape (such as the name of the manufacturer that created the tape), as well as statistical information about the cartridge's use. The LTO-CM enhances the efficiency of the cartridge. For example, the LTO-CM stores the end-of-data location which, when you next insert a cartridge and issue the Write command, enables the drive to quickly locate the recording area and begin recording. The LTO-CM also aids in determining the reliability of the cartridge by storing data about its age, how many times it has been loaded, and how many errors it has accumulated. Whenever you unload a tape cartridge, the tape drive writes any pertinent information to the cartridge memory. The storage capacity of the LTO-CM is 4096 bytes.

The cartridge door **2** protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader pin **3** . When you insert the cartridge into the drive, a threading mechanism pulls the pin (and tape) out of the cartridge, across the drive head, and onto a non-removable takeup reel. The head can then read or write data from or to the tape.

The write-protect switch **4** prevents data from being written to the tape cartridge. The label area **5** provides a location for you to place a label. Affix only a bar code label. When affixing a label, place it only in the recessed label area. A label that extends outside of the recessed area can cause loading problems in the internal drive or in the UltraScalable Tape Library. The insertion guide **6** is a large, notched area that prevents you from inserting the cartridge incorrectly.

You can order tape cartridges with the bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see “Ordering Media Supplies” on page 215.

Both generations of the LTO Ultrium Data Cartridge have a nominal cartridge life of 5000 load and unload cycles.

Cleaning Cartridge

To maintain the operating efficiency of the drive, IBM supplies a cleaning cartridge with the first drive in each Model L32 or D32 frame of the UltraScalable Tape Library. Each drive determines when it needs to be cleaned and alerts the library. Depending on which cleaning method you choose, the library uses the cleaning cartridge to automatically clean the drive, or you are required to select menus to initiate cleaning (for information about cleaning methods, see “Drive Cleaning” on page 24).

Note: The volume serial number (VOLSER) on the cleaning cartridge’s bar code label must begin with **CLNI** or **CLNU**, or the library treats the cleaning cartridge as a data cartridge during an inventory.

The IBM TotalStorage LTO Ultrium Cleaning Cartridge and the LTO Ultrium Cleaning Cartridge are downward-compatible with the Ultrium 1 drive. To enable your Ultrium 1 drive to use these cartridges, simply download and install the latest drive firmware (for instructions, see “Updating Drive Firmware” on page 194).

Before a drive can be cleaned, you must ensure that a cleaning cartridge is loaded in the library (to determine whether one or more cleaning cartridges are loaded, see “Removing a Cleaning Cartridge from the Library” on page 86). You can load multiple cleaning cartridges and store them in any cartridge storage slot except the slot that is reserved for the diagnostic cartridge (see “Non-Addressable Cartridge Storage Slot” on page 47).

The UltraScalable Tape Library monitors the use of all cleaning cartridges. The IBM Cleaning Cartridges are valid for 50 uses. When the cartridge expires, the library displays the following sample message on the Activity screen (where xx equals characters of the cartridge’s VOLSER):

```
Remove CLNUxxL1
Cleaning Cartridge Expired
```

The cartridge’s LTO-CM chip tracks the number of times that the cartridge is used. To remove a cleaning cartridge, see “Removing a Cleaning Cartridge from the Library” on page 86.

Diagnostic Cartridge

The diagnostic cartridge is a cartridge with known good media that is reserved for diagnostic purposes only. One cartridge slot in the base frame (Model L32) is reserved to house the diagnostic cartridge. The slot is located at Column 1, Row 1. During service calls, your IBM Service Representative will use the cartridge to ensure that the tape drives run correctly and to specification.

Bar Code Label

Each data, cleaning, and diagnostic cartridge that is processed by the UltraScalable Tape Library must bear a bar code label. The label contains:

- A volume serial number (VOLSER) that you can read
- A bar code that the library can read

When read by the library's bar code reader, the bar code identifies the cartridge's VOLSER to the tape library. The bar code also tells the library whether the cartridge is a data, cleaning, or diagnostic cartridge. In addition, the bar code includes the two-character media-type identifier Lx, where x equals 1 or 2. L identifies the cartridge as an LTO cartridge. 1 indicates that the cartridge is the first generation of its type; 2 indicates that the cartridge is the second generation of its type. Figure 37 shows a sample bar code label for the LTO Ultrium Tape Cartridge.

You can order tape cartridges with the labels included, or you can order custom labels. To order tape cartridges and bar code labels, see "Ordering Media Supplies" on page 215. The bar code must meet predefined specifications. They include (but are not limited to):

- Eight uppercase alphanumeric characters, where the last two characters must be L1 or L2
- Label and printing to be non-glossy
- Nominal narrow line or space width of 0.423 mm (0.017 in.)
- Wide to narrow ratio of 2.75:1
- Minimum bar length of 11.1 mm (0.44 in.)

To determine the complete specifications of the bar code and the bar code label, visit the web at http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec.pdf or contact your IBM Sales Representative.

When attaching a bar code label to a tape cartridge, place the label only in the recessed label area (see **4** in Figure 36 on page 197). A label that extends outside of the recessed area can cause loading problems in the drive or the library.

Attention: Do not place any type of mark on the white space at either end of the bar code. A mark in this area may prevent the UltraScalable Tape Library from reading the label.

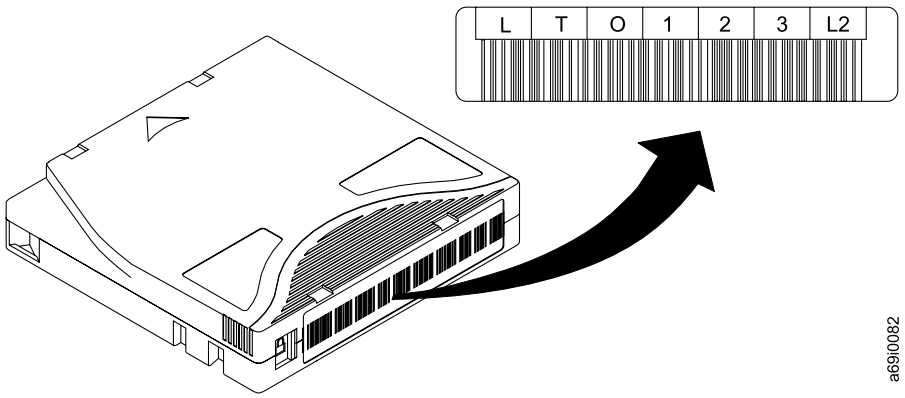

Figure 37. Sample bar code label on the LTO Ultrium 2 Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.

Guidelines for Using Bar Code Labels

Apply the following guidelines whenever you use bar code labels:

- Use only IBM-approved bar code labels.
- Do not reuse a label or reapply a used label over an existing label.
- Before you apply a new label, remove the old label by slowly pulling it at a right angle to the cartridge case.
- Use peel-clean labels that do not leave a residue after they are removed. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger; do not use a sharp object, water, or a chemical to clean the label area.
- Examine the label before you apply it to the cartridge. Do not use the label if it has voids or smears in the printed characters or bar code (an application's inventory operation will take much longer if the bar code label is not readable).
- Remove the label from the label sheet carefully. Do not stretch the label or cause the edges to curl.
- Position the label within the recessed label area (see **5** in Figure 36 on page 197).
- With light finger pressure, smooth the label so that no wrinkles or bubbles exist on its surface.
- Verify that the label is smooth and parallel, and has no roll-up or roll-over. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label and have no folds, missing pieces, or smudges.
- Do not place other machine-readable labels on other surfaces of the cartridge. They may interfere with the ability of the bar code reader to read the bar code.

Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 38) determines whether you can write to the tape:

- If the switch is set to (solid red), data cannot be written to the tape.
- If the switch is set to unlocked (black void), data can be written to the tape.

If possible, use your server's application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the server's software to identify a cartridge that no longer contains current data and is eligible to become a scratch cartridge. Do not write-protect scratch (blank) cartridges; the tape drive will not be able to write new data to them.

If you must manually set the write-protect switch, slide it left or right to the desired position.

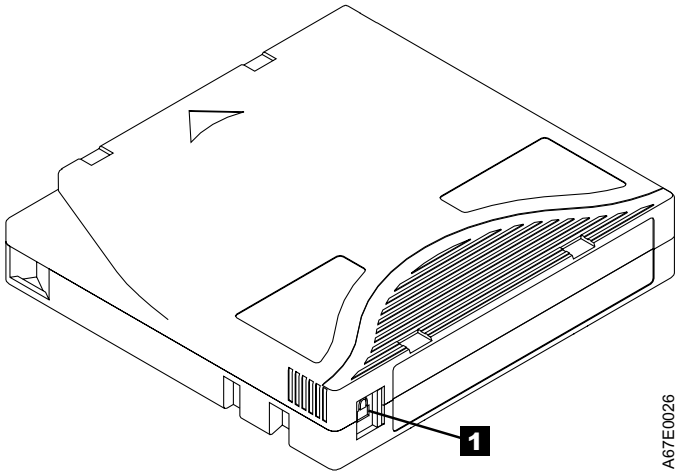

Figure 38. Setting the write-protect switch

Handling the Cartridges

Attention: Do not insert a damaged tape cartridge into your UltraScalable Tape Library. A damaged cartridge can interfere with the reliability of a drive and may void the warranties of the drive and the cartridge. Before inserting a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for breaks. If you need to recover data from a damaged cartridge, contact your IBM Service Representative.

Incorrect handling or an incorrect environment can damage the IBM LTO Ultrium Tape Cartridges or their magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your IBM LTO Ultrium Tape Drives, use the following guidelines:

Provide Training

- Post procedures that describe proper media handling in places where people gather.
- Ensure that anyone who handles tape has been properly trained in handling and shipping procedures. This includes operators, users, programmers, archival services, and shipping personnel.
- Ensure that any service or contract personnel who perform archiving are properly trained in media-handling procedures.
- Include media-handling procedures as part of any services contract.
- Define and make personnel aware of data recovery procedures.

Ensure Proper Packaging

- When you ship a cartridge, ship it in its original or better packaging.
- Always ship or store a cartridge in a jewel case.
- Use only a recommended shipping container that securely holds the cartridge in its jewel case during transportation. Ultrium Turtlecases (by Perm-A-Store) have been tested and found to be satisfactory (see Figure 39). They are available at `http://www.turtlecase.com`.

Figure 39. Tape cartridges in a Turtlecase

- Never ship a cartridge in a commercial shipping envelope. Always place it in a box or package.
- If you ship the cartridge in a cardboard box or a box of a sturdy material, ensure the following:
  - Place the cartridge in polyethylene plastic wrap or bags to protect it from dust, moisture, and other contaminants.
  - Pack the cartridge snugly; do not allow it to move around.
  - Double-box the cartridge (place it inside a box, then place that box inside the shipping box) and add padding between the two boxes (see Figure 40 on page 204).

Figure 40. Double-boxing tape cartridges for shipping

Provide Proper Acclimation and Environmental Conditions

- Before you use a cartridge, let it acclimate to the normal operating environment for 1 hour. If you see condensation on the cartridge, wait an additional hour.
- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not expose the cartridge to moisture or direct sunlight.
- Do not expose recorded or blank cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment, or fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in “Environmental and Shipping Specifications for Tape Cartridges” on page 214.

Perform a Thorough Inspection

After purchasing a cartridge and before using it, perform the following steps:

- Inspect the cartridge’s packaging to determine potential rough handling.
- When inspecting a cartridge, open only the cartridge door. Do not open any other part of the cartridge case. The upper and lower parts of the case are held together with screws; separating them destroys the usefulness of the cartridge.
- Inspect the cartridge for damage before using or storing it.
- Inspect the rear of the cartridge (the part that you load first into the tape load compartment) and ensure that there are no gaps in the seam of the cartridge case (see **1** in Figure 41 on page 205 and **4** in Figure 43 on page 208). If there are gaps in the seam (see Figure 41 on page 205), the leader pin may be dislodged. Go to “Repositioning or Reattaching a Leader Pin” on page 207.

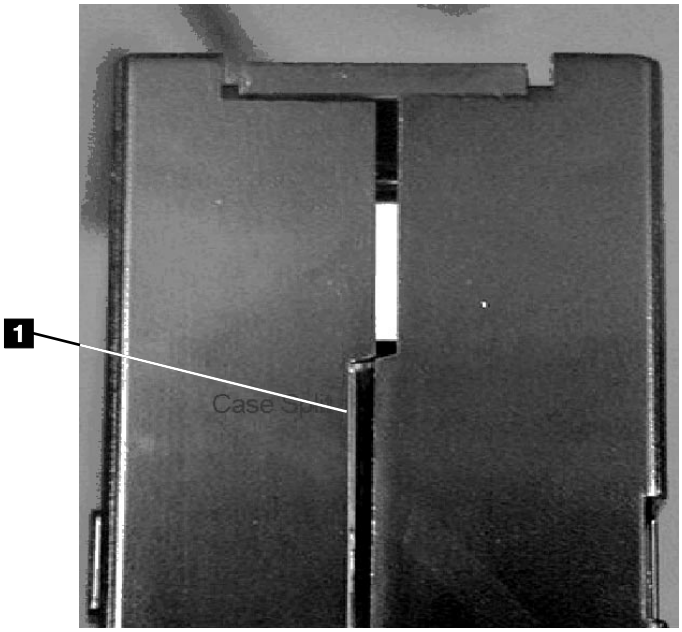

Figure 41. Checking for gaps in the seams of a cartridge

- Check that the leader pin is properly seated (see **2** in Figure 42 on page 207).
- If you suspect that the cartridge has been mishandled but it appears useable, copy any data onto a good cartridge immediately for possible data recovery. Discard the mishandled cartridge.
- If you must recover data from a damaged cartridge, contact your service representative.
- Review handling and shipping procedures.

Handle the Cartridge Carefully

- Do not drop the cartridge. If the cartridge drops, slide the cartridge door back and ensure that the leader pin is properly seated in the pin-retaining spring clips (see **2** in Figure 42 on page 207). If the leader pin has become dislodged, go to "Repositioning or Reattaching a Leader Pin" on page 207.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape's surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Do not stack more than six cartridges.
- Do not degauss a cartridge that you intend to reuse. Degaussing makes the tape unusable.

Examples of Cartridge Problems

Example: Split Cartridge Case (see Figure 41 on page 205)

The cartridge's case is damaged. There is a high possibility of media damage and potential loss. Perform the following steps:

1. Look for cartridge mishandling.
2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see "Repositioning a Leader Pin" on page 207). Then, immediately use data recovery procedures to minimize chances of data loss.
3. Review media-handling procedures.

Example: Improper Placement of Leader Pin (see Figure 42 on page 207)

The leader pin is misaligned. Perform the following steps:

1. Look for cartridge damage.
2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see "Repositioning a Leader Pin" on page 207). Then, immediately use data recovery procedures to minimize chances of data loss.

Repositioning or Reattaching a Leader Pin

Attention: Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

If the leader pin in your cartridge becomes dislodged from its pin-retaining spring clips or detaches from the tape, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reposition or reattach it. (Do not reattach the pin if you must remove more than 7 meters (23 feet) of leader tape.) The sections that follow describe each procedure.

Repositioning a Leader Pin

A leader pin that is improperly seated inside a cartridge can interfere with the operation of the drive. Figure 42 shows a leader pin in the incorrect **1** and correct **2** positions.

To place the leader pin in its proper position, you will need the following tools:

- Plastic or blunt-end tweezers
- Cartridge manual rewind tool (from Leader Pin Reattachment Kit, part number 08L9129)

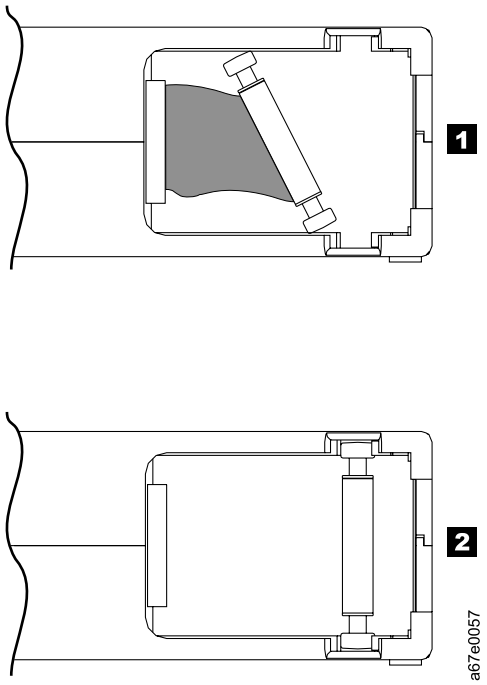

Figure 42. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (1 in Figure 43) and locate the leader pin 2 (you may need to shake the cartridge gently to roll the pin toward the door).
2. With plastic or blunt-end tweezers, grasp the leader pin and position it in the pin-retaining spring clips 3 .
3. Press the leader pin gently into the clips until it snaps into place and is firmly seated. Ensure that there are no gaps in the seam of the cartridge 4 .

   Attention: If gaps exist, do not continue with this procedure and do not use the cartridge. Instead, contact your IBM Service Representative.
4. Close the cartridge door.

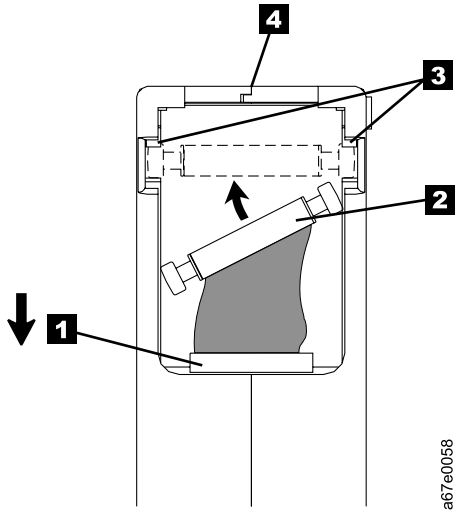

Figure 43. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (1 in Figure 44) into the cartridge's hub 2 and turn it clockwise until the tape becomes taut.

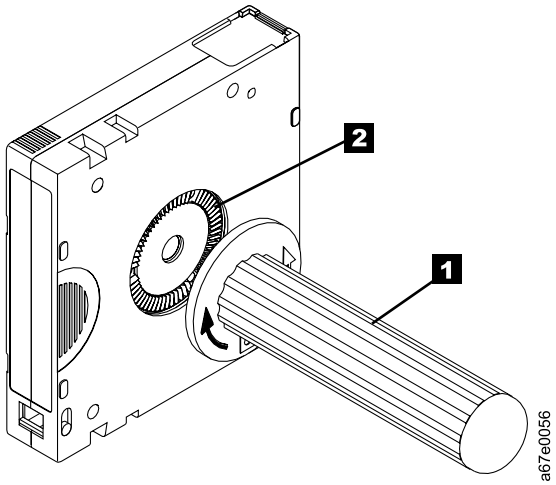

Figure 44. Rewinding the tape into the cartridge

6. Remove the rewind tool by pulling it away from the cartridge.

Reattaching a Leader Pin

The first meter of tape in a cartridge is leader tape. Once the leader tape has been removed there is a possibility of tape breakage. After reattaching the leader pin, transfer data from the defective tape cartridge. **Do not reuse the defective tape cartridge**.

The Leader Pin Reattachment Kit contains three parts:

- **Leader pin attach tool** (see 1 in Figure 45). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see 2 in Figure 45). A device that fits into the cartridge's hub and lets you wind the tape into and out of the cartridge.
- **Pin supplies** (see 3 in Figure 45). Leader pins and C-clips.

Attention:

- Use only the IBM Leader Pin Reattachment Kit to reattach the leader pin to the tape. Other methods of reattaching the pin will damage the tape, the drive, or both.
- Use this procedure on your tape cartridge only when the leader pin detaches from the magnetic tape and you must copy the cartridge's data onto another cartridge. Destroy the damaged cartridge after you copy the data. This procedure may affect the performance of the leader pin during threading and unloading operations.
- Touch only the end of the tape. Touching the tape in an area other than the end can damage the tape's surface or edges, which may interfere with read or write reliability.

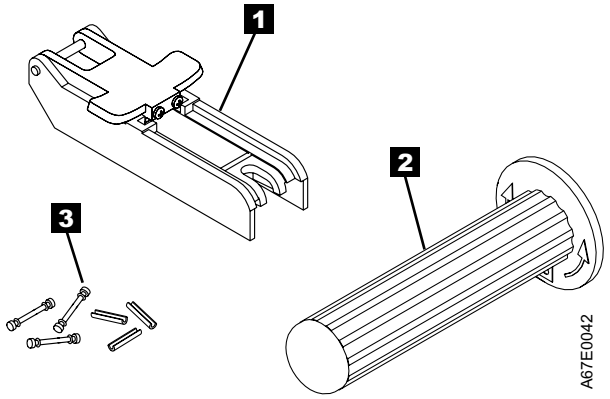

Figure 45. Leader Pin Reattachment Kit

The following procedure describes how to reattach a leader pin.

To reattach a leader pin by using the IBM Leader Pin Reattachment Kit:

1. Attach the leader pin attach tool (**1** in Figure 46) to the cartridge **2** so that the tool's hook **3** latches into the cartridge's door **4** . Pull the tool back to hold the door open, then slide the tool onto the cartridge. Open the tool's pivot arm **5** .

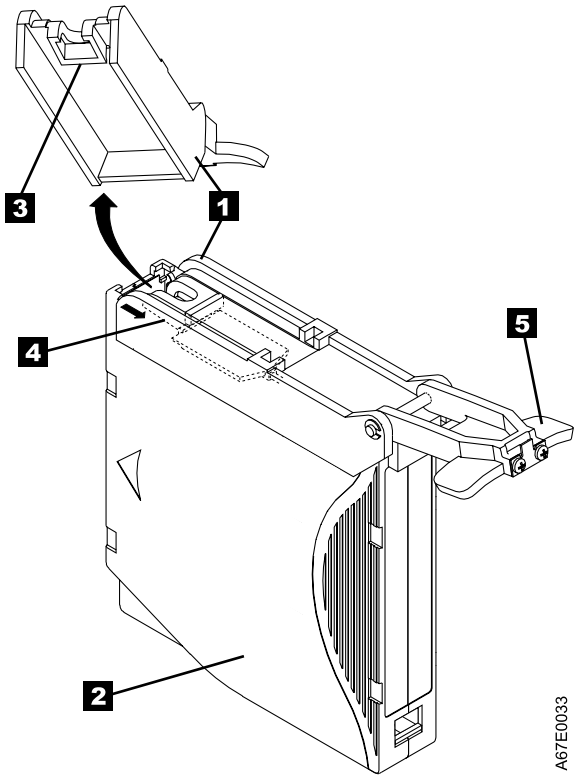

Figure 46. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (1 in Figure 47) to the cartridge's hub 2 by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you see the end of the tape inside the cartridge. Then, slowly turn the rewind tool counterclockwise to bring the tape edge toward the cartridge door 3 .
3. Continue to turn the rewind tool counterclockwise until approximately 13 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.
4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.

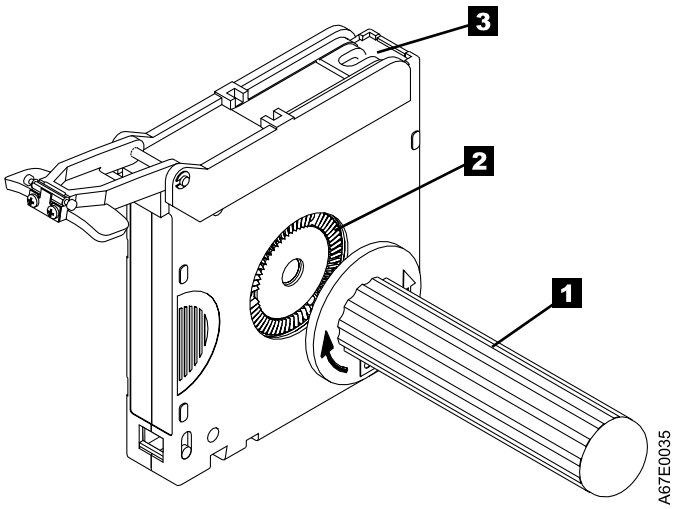

Figure 47. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (1 in Figure 48), locate the open side of the C-clip 2 . The C-clip is a small black part that secures the tape 3 to the pin.
6. Remove the C-clip from the leader pin by using your fingers to push the clip away from the pin. Set the pin aside and discard the clip.

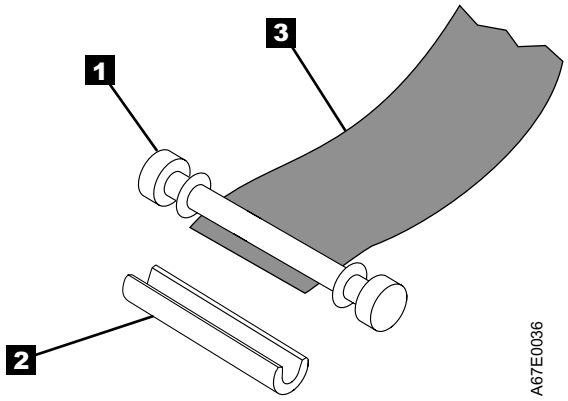

Figure 48. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see 1 in Figure 49).
8. Place a new C-clip into the retention groove 2 (Figure 49) on the leader pin attachment tool and make sure that the clip's open side faces up.
9. Place the leader pin (from step 6 on page 211) into the cavity 3 (Figure 49) of the leader pin attach tool.

Attention: To prevent the leader pin from rolling into the cartridge, in the following step use care when folding the tape over the pin.

10. Fold the tape over the leader pin and hold it with your fingers (see Figure 49).

    Note: Use care to ensure that the tape is centered over the leader pin. Failure to properly center the tape on the pin will cause the repaired cartridge to fail. When the tape is properly centered, a 0.25-mm (0.01-in.) gap exists on both sides of the pin.

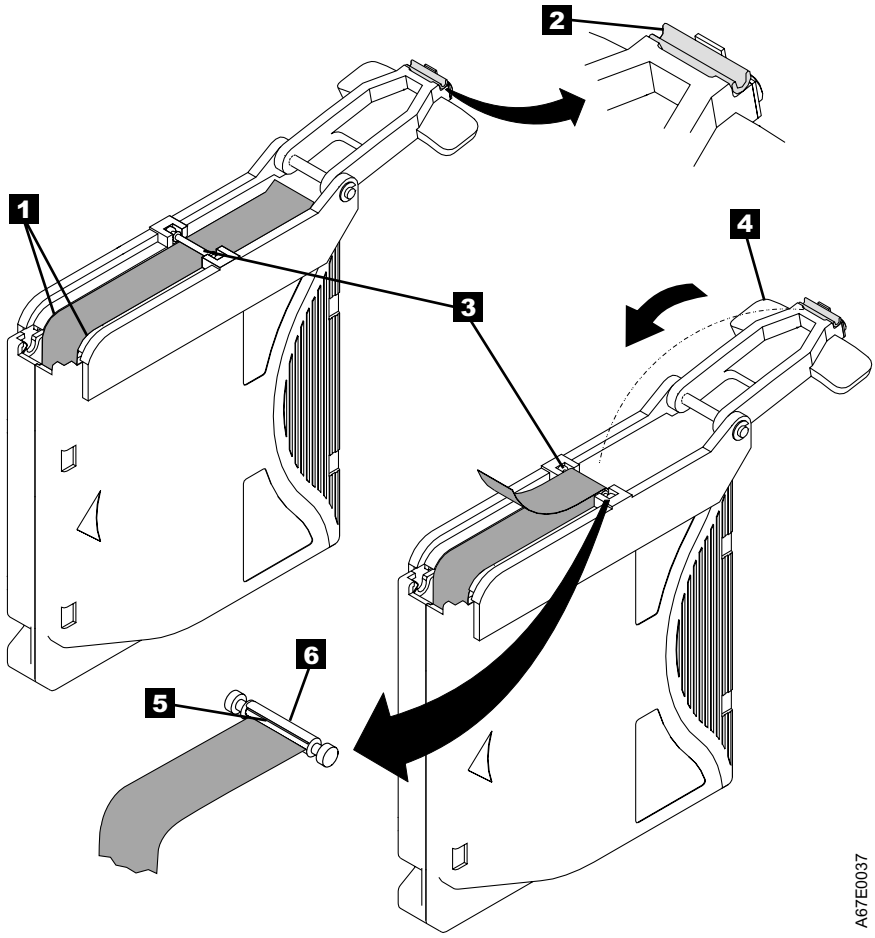

Figure 49. Attaching the leader pin to the tape

11. Close the pivot arm 4 of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.
12. Swing the pivot arm open and trim the excess tape 5 so that it is flush with the reattached leader pin 6 .

13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.
15. Remove the rewind tool.
16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.

Attention: Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation in the drive (the time will vary, depending on the environmental extremes to which the cartridge was exposed).

The best storage container for the cartridges (until they are opened) is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

Attention: Depending on how many drives you have installed in the frame, the temperature inside the frame may be as much as 5°C (9°F) above the temperature outside the frame. To ensure continued reliability of your media, be sure to take this temperature difference into account when you set up the environment around your library.

When you ship a cartridge, place it in its jewel case or in a sealed, moisture-proof bag to protect it from moisture, contaminants, and physical damage. Ship the cartridge in a shipping container that has enough packing material to cushion the cartridge and prevent it from moving within the container.

Table 19 gives the environment for operating, storing, and shipping LTO Ultrium Tape Cartridges.

Table 19. Environment for operating, storing, and shipping the LTO Ultrium Tape Cartridge

	Environmental Specifications			
Environmental Factor	**Operating**	**Operational Storage[1]**	**Archival Storage[2]**	**Shipping**
Temperature	10 to 45°C (50 to 113°F)	16 to 32°C (61 to 90°F)	16 to 25°C (61 to 77°F)	–23 to 49°C (–9 to 120°F)
Relative humidity (noncondensing)	10 to 80%	20 to 80%	20 to 50%	5 to 80%
Maximum wet bulb temperature	26°C (79°F)	26°C (79°F)	26°C (79°F)	26°C (79°F)

Notes:

1. Operational storage equals less than 1 year.
2. Archival storage equals 1 to 10 years.

Disposing of Tape Cartridges

Under the current rules of the U.S. Environmental Protection Agency (EPA), regulation 40CFR261, the LTO Ultrium Tape Cartridge is classified as non-hazardous waste. As such, it may be disposed of in the same way as normal office trash. These regulations are amended from time to time, and you should review them at the time of disposal.

If your local, state, country (non-U.S.A.), or regional regulations are more restrictive than EPA 40CFR261, you must review them before you dispose of a cartridge. Contact your account representative for information about the materials that are in the cartridge.

If a tape cartridge must be disposed of in a secure manner, you can erase the data on the cartridge by using a high-energy ac degausser (use a minimum of 1200 oersted peak field over the entire space that the cartridge occupies). Degaussing makes the cartridge unusable.

If you burn the cartridge and tape, ensure that the incineration complies with all applicable regulations.

Ordering Media Supplies

Table 20 lists the cartridges and media supplies that you can order for the UltraScalable Tape Library.

Table 20. Ordering media supplies for the UltraScalable Tape Library

Supply Item	Method of Ordering
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 217).	• Order as part number 08L9870 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 007. • Call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Bar code labels are preapplied to cartridges.	• Order as part number 19P5887 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). Specify the VOLSER characters that you want. • Order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 006. Specify the VOLSER characters that you want. • Call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM LTO Ultrium 100 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 217).	• Order as part number 08L9120 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 003. • Call 1-888-IBM-MEDIA.

Table 20. Ordering media supplies for the UltraScalable Tape Library (continued)

Supply Item	Method of Ordering
IBM LTO Ultrium 100 GB Data Cartridge Bar code labels are preapplied to cartridges.	• Order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 002. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal cleaning cartridge for use with Ultrium 1 and Ultrium 2 drives) Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 217).	• Order as part number 35L2086 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 004. • Call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal cleaning cartridge for use with Ultrium 1 and Ultrium 2 drives) Bar code labels are preapplied to cartridges.	• Order as part number 35L2087 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative. • Call 1-888-IBM-MEDIA.
Leader Pin Reattachment Kit	Order as part number 08L9129 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`).

Ordering Bar Code Labels

Bar code labels with VOLSERs are required for cartridges that are read by the UltraScalable Tape Library. You can order these labels separately from the IBM Data Cartridges and Cleaning Cartridges.

You can order bar code labels directly from the authorized label suppliers in Table 21.

Table 21. Authorized suppliers of custom bar code labels

In America	In Europe and Asia
EDP/Colorflex 697 South Pierce Street Louisville, CO 80027 U. S. A. Telephone: 800-522-3528 http://www.colorflex.com/Ai/Home.asp	EDP Europe, Ltd. 43 Redhills Road South Woodham Ferrers Chelmsford, Essex CM3 5UL U. K. Telephone: 44 (0) 1245-322380 http://www.edpeurope.com/media_labelling.htm
Dataware 7570 Renwick Houston, TX 77081 U. S. A. Telephone: 800-426-4844 http://www.datawarelabels.com/	Dataware Labels Europe Heubergstrasse 9 D-83052 Bruckmuhl-Gotting Germany Telephone: 49 806-29455 http://www.datawarelabels.com/
NetC P. O. Box 320784 Fairfield, CT 06432 U. S. A. Telephone: 203-372-6382 http://www.netcllc.com/	NetC Europe Ltd Town Farm Bungalow North Curry Taunton Somerset U. K. TA3 6LX Telephone: 44 (0) 1823 491439 http://www.netclabels.co.uk
	NetC Asia Pacific Pty Ltd Locked Bag 14 Kenthurst NSW Australia 2156 Telephone: 61 (0) 2 9654 8272 http://www.netclabels.com.au

Chapter 6. Using DLT Media

In addition to automating the storage and movement of IBM LTO Ultrium Tape Cartridges, the UltraScalable Tape Library does the same for DLT Tape Cartridges. Within the library, the DLT 8000 Tape System uses the following cartridge types:

- DLTtapeIV Data Cartridge
- DLTtapeIIIXT Data Cartridge
- DLTtapeIII Data Cartridge
- DLTtape IV Cleaning Cartridge

To ensure that your tape library conforms to IBM's specifications for reliability, use only the preceding cartridges. You may use other DLT-certified data cartridges, but they may not meet the standards of reliability established by IBM.

Figure 50 shows the DLTtape IV Data Cartridge and its components.

1	Label area	3	Cartridge door
2	Write-protect switch	4	Leader

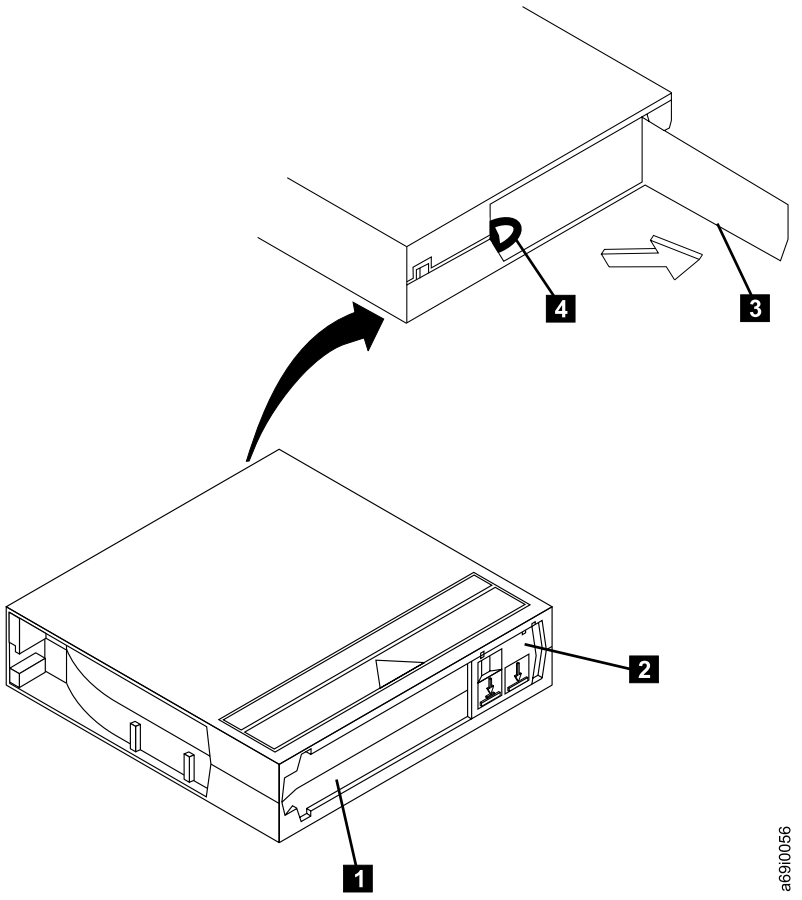

Figure 50. Components of the DLTtape IV Data Cartridge

Data Cartridge

In the UltraScalable Tape Library, frames that have DLT 8000 Tape Systems installed use the single-reel DLTtape IV Data Cartridges. The cartridge contains 1/2-inch recording tape that stores 40 GB of native data and 80 GB of compressed data (assuming 2:1 compression).

The DLTtape IV Data Cartridge is black, and the DLTtape IV Cleaning Cartridge is white.

The label area **1** provides a location for you to place a label. Affix only a bar code label. When affixing a label, place it only in the recessed label area. A label that extends outside of the recessed area can cause loading problems in the internal drive or in the UltraScalable Tape Library. The write-protect switch **2** prevents data from being written to the tape cartridge.

The cartridge door (**3** in Figure 36 on page 197) protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader **4** . When you insert the cartridge into the drive, a threading mechanism pulls the tape out of the cartridge, across the drive head, and onto a non-removable takeup reel. The head can then read or write data from or to the tape.

The DLT 8000 Tape System is downward compatible to the DLT Tape Cartridges listed in Table 22.

Table 22. Tape cartridges that are compatible with the DLT 8000 Tape System

Type of Cartridge Supported	Native Data Capacity	Compressed Data Capacity (see Note)
DLTtapeIV	40 GB	80 GB (default for drive)
	35 GB	70 GB
	20 GB	40 GB
DLTtapeIIIXT	15 GB	30 GB (default for drive)
DLTtapeIII	10 GB	20 GB (default for drive)
Note: The amount of compression depends on the type of data. A ratio of 2:1 is assumed.		

You can order tape cartridges with the bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see “Ordering Media Supplies” on page 230.

The DLTtape IV Data Cartridge has a nominal cartridge life of 10,000 load and unload cycles. The quantity of load and unload cycles to reach this number depends on the environment in which the tape is used.

Cleaning Cartridge

With each UltraScalable Tape Library, IBM supplies a specially labeled DLTtape IV Cleaning Cartridge with the first DLT 8000 Tape System in each Model D42 frame. Each drive determines when it needs to be cleaned and alerts the library. Depending on which cleaning method you choose, the library uses the cleaning cartridge to automatically clean the drive, or you are required to select menus to initiate cleaning (for information about cleaning methods, see “Drive Cleaning” on page 24).

Note: The volume serial number (VOLSER) on the cartridge’s bar code label must begin with **CLN** or the library treats the cleaning cartridge as a data cartridge during an inventory.

Before a drive can be cleaned, you must ensure that a DLTtape IV Cleaning Cartridge is loaded in the library (to determine whether one or more cleaning cartridges are loaded, see “Removing a Cleaning Cartridge from the Library” on page 86). You can load multiple cleaning cartridges and store them in any cartridge storage slot except the two slots that are reserved for the diagnostic cartridges (see “Non-Addressable Cartridge Storage Slot” on page 47).

The UltraScalable Tape Library monitors the use of all cleaning cartridges. A cleaning cartridge is valid for 20 cleanings. When the cartridge expires, the library displays the following message displays on the Activity screen (where xxx equals the VOLSER of the cleaning cartridge):

```
Remove CLNxxx
Cleaning Cartridge Expired
```

To remove a cleaning cartridge, see “Removing a Cleaning Cartridge from the Library” on page 86.

Diagnostic Cartridge

The diagnostic cartridge is a cartridge with verified media that is reserved for diagnostic purposes only. Two storage slots are reserved in the first DLT frame for DLTtape IV diagnostic cartridges. The slots are located at Column 1, Row 1 and Column 1, Row 2. During service calls, your IBM Service Representatives will use the cartridge to ensure that the tape drives run correctly and to specification.

Bar Code Label

Each data, cleaning, and diagnostic cartridge that is processed by the UltraScalable Tape Library must bear a bar code label. The label contains:

- A volume serial number (VOLSER) that you can read
- A bar code that the library can read

When read by the library's bar code reader, the bar code identifies the cartridge's VOLSER to the tape library. The bar code also tells the library whether the cartridge is a data, cleaning, or diagnostic cartridge. Figure 51 shows a sample bar code label for the DLTtape IV Tape Cartridge.

You can order tape cartridges with the labels included, or you can order custom labels. The labels may have a peel-and-stick backing or you can slide them into the label area. To order tape cartridges and bar code labels, see "Ordering Media Supplies" on page 230. The bar code must meet predefined specifications. The recommended specifications include (but are not limited to):

- Six uppercase alphanumeric characters
- Label and printing to be non-glossy
- Nominal narrow line or space width of 0.423 mm (0.017 in.)
- Wide to narrow ratio of 2.75:1
- Minimum bar length of 11.1 mm (0.44 in.)

To determine the complete specifications of the bar code and the bar code label, contact your IBM Sales Representative.

When attaching a bar code label to a tape cartridge, place the label only in the recessed label area (see Figure 51). A label that extends outside of the recessed area can cause loading problems in the drive or the library.

Attention: Do not place any type of mark on the white space at either end of the bar code. A mark in this area may prevent the UltraScalable Tape Library from reading the label.

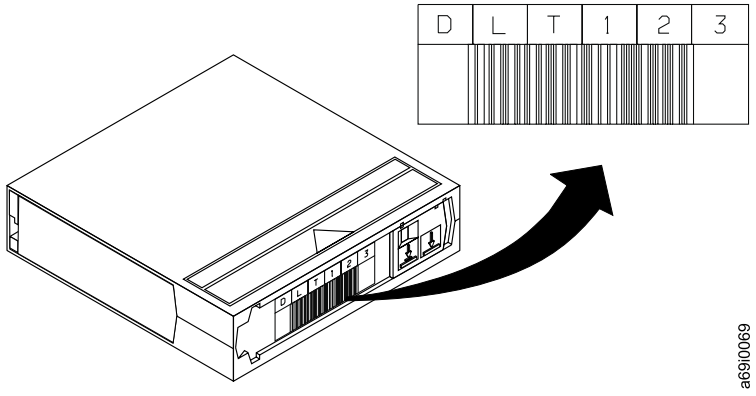

Figure 51. Sample bar code label on the DLTtape IV Tape Cartridge. The volume serial number (DLT123) and bar code are printed on the label.

Guidelines for Using Bar Code Labels

Apply the following guidelines whenever you use peel-and-stick or slide-in bar code labels:

- Use only IBM-approved bar code labels.
- Do not reuse a label or reapply a used label over an existing label.
- Examine the label before you apply it to the cartridge. Do not use the label if it has voids or smears in the printed characters or bar code (an application's inventory operation will take much longer if the bar code label is not readable).
- Position the label within the recessed label area (see **1** in Figure 50 on page 219).
- Verify that the label is smooth and parallel, and has no roll-up or roll-over. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label and have no folds, missing pieces, or smudges.
- Do not place other machine readable labels on other surfaces of the cartridge. They may interfere with the ability of the bar code reader to read the bar code.

For peel-and-stick labels, apply the following recommendations:

- Use peel-clean labels that do not leave a residue after they are removed. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger; do not use a sharp object, water, or a chemical to clean the label area.
- Before you apply a new label, remove the old label by slowly pulling it at a right angle to the cartridge case.
- Remove the label from the label sheet carefully. Do not stretch the label or cause the edges to curl.
- With light finger pressure, smooth the label so that no wrinkles or bubbles exist on its surface.

Handling the Cartridges

Incorrect handling or an inhospitable environment can damage the DLTtape IV Tape Cartridge or its magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your UltraScalable Tape Library, use the following guidelines:

- Do not drop or bump the cartridge. This may dislodge or damage the cartridge's internal components.
- Before using the cartridge, inspect it carefully as described in "Inspecting the Tape Cartridge" on page 225.
- Ensure that all surfaces of the cartridge are dry before inserting it.
- Do not load a damaged tape cartridge into the UltraScalable Tape Library. A damaged cartridge can interfere with the reliability of the unit. Before loading a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for cracks or breaks. If you need to recover data from a damaged cartridge, call your IBM Service Representative.

  Note: IBM charges you for the time and materials that are used during the service call.
- Do not open the cartridge case at any time. The upper and lower parts of the case are welded; separating them destroys the usefulness of the cartridge.
- Avoid opening the cartridge door, except during tape inspection. This may expose the tape to contamination or physical damage.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape's surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Store data cartridges vertically and in their plastic cases.
- Do not stack more than six cartridges. Although cartridges are shipped and should be stored with the reel in the vertical position, you can temporarily lay the cartridges flat when moving them.
- Do not carry tape cartridges loosely in a box or any other container.
- Do not expose the tape cartridge to moisture or direct sunlight.
- Do not operate the UltraScalable Tape Library in a dusty environment.
- Do not touch the tape or tape leader. Natural skin oils can contaminate the tape and impact tape performance.
- Do not degauss a tape cartridge that you intend to reuse. Degaussing will make the tape unusable.
- **Do not perform bulk erasure of the tape.** Bulk erasure will make the cartridge unusable.
- Do not expose recorded or blank tape cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment or fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in "Environmental and Shipping Specifications for Tape Cartridges" on page 229.

Inspecting the Tape Cartridge

Inspect a tape cartridge for damage and proper tape leader alignment before inserting it into a tape drive and whenever one or more of the following conditions apply:

- The cartridge was dropped or subjected to hard physical shock
- The tape drive became inoperable after loading a tape cartridge
- The cartridge shows signs of damage

Use the following steps to inspect the DLT Tape Cartridge:

1. Check for proper operation of the write-protect switch. The sliding switch should move back and forth with a snap. The orange tab should be visible when the cartridge is write protected.
2. Examine the cartridge for cracks, physical damage, broken parts, or missing parts. If they are present, dispose of the cartridge.
3. Gently shake the cartridge and listen for rattling or sounds of loose pieces inside the cartridge. If odd sounds exist, dispose of the cartridge.
4. Hold the cartridge so that its insertion end faces you and inspect the white plastic tab on the left (see **1** in Figure 52). The tab is one of two cartridge reel locks. If the tab is not visible, dispose of the cartridge.

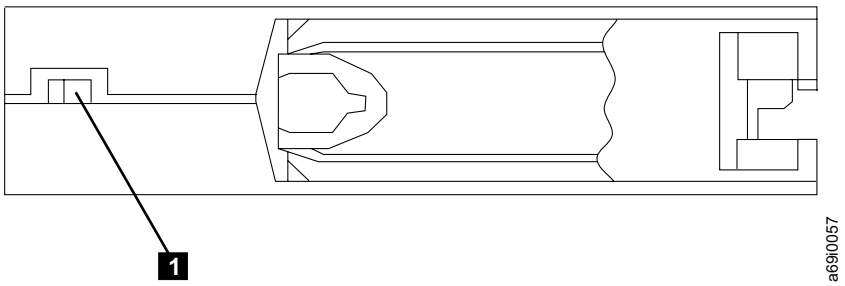

Figure 52. Checking the cartridge's side reel lock

5. Turn the cartridge over and inspect the white plastic tab on the right (see **1** in Figure 53). The tab is the second of two cartridge reel locks. If the tab is not visible, dispose of the cartridge.
6. Ensure that the spring-loaded hub **2** is centered within the circular opening of the cartridge. Press the hub and ensure that it springs back and is centered. If not, dispose of the cartridge.

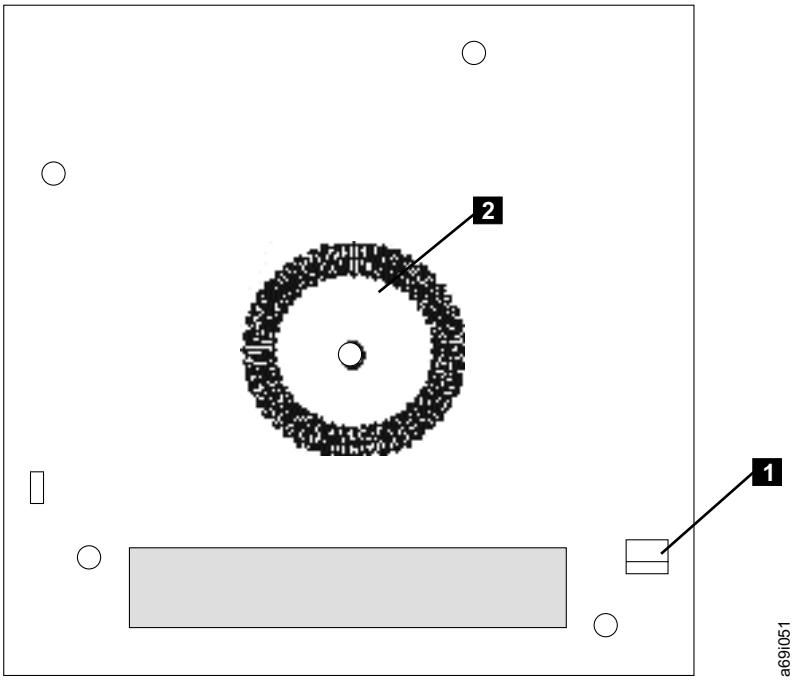

Figure 53. Checking the cartridge's bottom reel lock

7. Open the cartridge door (**1** in Figure 54 on page 227) by pressing and holding the door-locking tab **2** upward, and pushing it away from you.

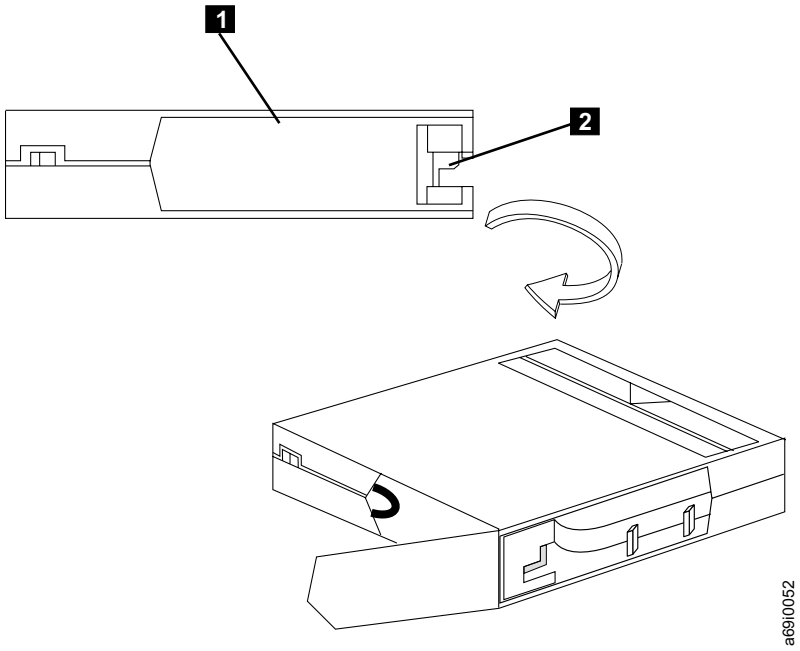

Figure 54. Opening the tape cartridge door

8. Ensure that the tape leader is positioned correctly (see **1** in Figure 55). If the leader is pulled too far into the cartridge, the drive cannot attach to it and pull the tape into the drive. Also, ensure that the tape is wound securely on the cartridge reel and is not loose. Check whether the loop on the leader is damaged; if so, replace the cartridge.

   Note: If your leader detaches or is pulled into the tape cartridge, contact your IBM Service Representative.

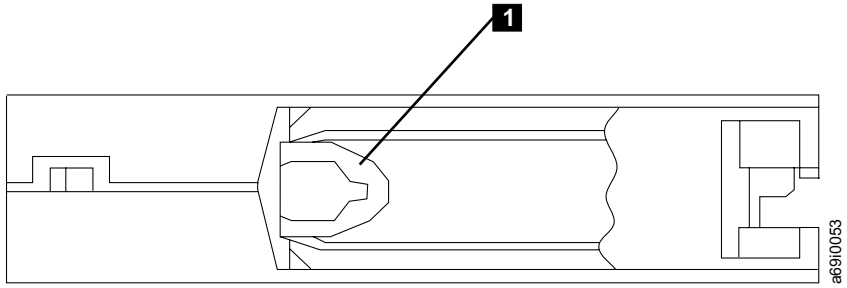

Figure 55. Cartridge leader in correct position

9. Inspect the tape leader and ensure that it is not damaged, torn, or bent. If damage is obvious, dispose of the cartridge.

Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 56) determines whether you can write to the tape:

- When you slide the switch to the left, data can be read but not written to the tape. The switch is set when the small orange rectangle **2** is visible.
- When you slide the switch to the right, data can be written to and read from the tape. The switch is set when the small orange rectangle is not visible.

Figure 56 shows the write-protect switch on the tape cartridge.

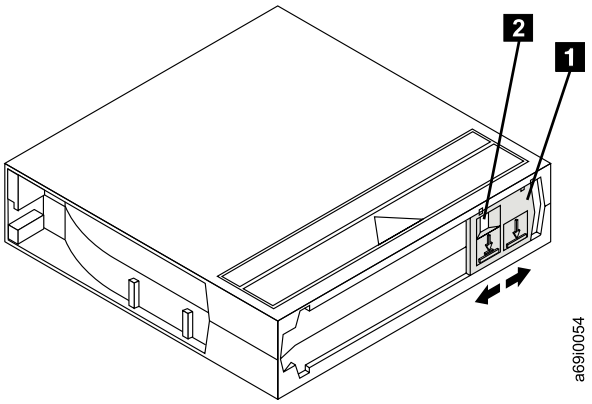

Figure 56. Setting the write-protect switch

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for a time equal to the time that it was out of the operating environment, up to a maximum of 24 hours.

The best storage container for the cartridges (until they are opened) is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

Attention: Depending on how many drives you have installed in the frame, the temperature inside the frame may be as much as 5°C (9°F) above the temperature outside the frame. To ensure continued reliability of your media, be sure to take this temperature difference into account when you set up the environment around your library.

When you ship a cartridge, place it in its jewel box or a sealed, moisture-proof bag to protect it from moisture, contaminants, and physical damage. Ship the cartridge in a shipping container that has enough packing material to cushion the cartridge and prevent it from moving within the container.

Table 23 gives the environment for operating, storing, and shipping DLTtape IV Tape Cartridges.

Table 23. Environment for operating, storing, and shipping the DLTtape IV Tape Cartridge

	Environmental Specifications				
Environmental Factor	**Operating**	**Storage without Data**[1]	**Storage with Data**	**Shipping without Data**[2]	**Shipping with Data**[2]
Temperature	10 to 40°C (50 to 104°F)	16 to 32°C (61 to 90°F)	18 to 28°C (64 to 82°F)	–23 to 48°C (–9 to 118°F)	5 to 32°C (–41 to 90°F)
Relative humidity (noncondensing)	20 to 80%	20 to 80%	40 to 60%	5% to 100%	5% to 80%
Maximum wet bulb temperature	25°C (77°F)	Not available	Not available	26°C (79°F)	26°C (79°F)

Notes:

1. Shelf life is 30 years at 20°C (68°F), 40% to 60% relative humidity.
2. Applies to a maximum duration of 10 consecutive days.

Disposing of Tape Cartridges

Under the current rules of the U.S. Environmental Protection Agency (EPA), regulation 40CFR261, the DLTtape IV Tape Cartridge is classified as non-hazardous waste. As such, it may be disposed of in the same way as normal office trash. These regulations are amended from time to time, and you should review them at the time of disposal.

If your local, state, country (non-U.S.A.), or regional regulations are more restrictive than EPA 40CFR261, you must review them before you dispose of a cartridge. Contact your account representative for information about the materials that are in the cartridge.

If a tape cartridge must be disposed of in a secure manner, IBM recommends that you use a qualified service provider to degauss and destroy the media.

If you burn the cartridge and tape, ensure that the incineration complies with all applicable regulations.

Ordering Media Supplies

Table 24 lists the DLTtape IV Tape Cartridges that you can order for the UltraScalable Tape Library.

Table 24. Ordering DLTtape IV Tape Cartridges for the UltraScalable Tape Library

Cartridge	Method of Ordering
Standard DLTtape IV Tape Cartridge Includes human-writable labels (black and white, or color). Also used as a diagnostic cartridge.	Order as part number 59H3040 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.storage.ibm.com/media/products.html`). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3859 Model 003.
Labeled DLTtape IV Tape Cartridge Includes bar code labels that are preapplied by the manufacturer (black and white, or color).	Order through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.storage.ibm.com/media/products.html`). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3859 Model 002.
Standard DLTtape IV Cleaning Cartridge Includes human-writable labels (black and white).	Order as part number 59H3092 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.storage.ibm.com/media/products.html`). If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3859 Model 004.

Ordering Bar Code Labels

Bar code labels are required for DLTtape IV Data Cartridge that are read by the UltraScalable Tape Library. You can order bar code labels directly from the following authorized label supplier. To determine label specifications, contact the supplier.

In America and Asia

EDP/Colorflex
697 South Pierce Street
Louisville, CO 80027
U. S. A.
Telephone: 800-522-3528
http://www.colorflex.com/Ai/Home.asp

In Europe

EDP Europe, Ltd.
43 Redhills Road
South Woodham Ferrers
Chelmsford, Essex CM3 5UL
U. K.
Telephone: 44 (0) 1245-322380
http://www.edpeurope.com/media_labelling.htm

Chapter 7. Using the Fibre Channel Interface

Attention: A Class I laser assembly, in the optical transceiver, is mounted on the Ultrium Fibre Channel electronics card. This laser assembly is registered with the Department of Health and Human Services and is in compliance with IEC825.

To communicate with a server, the IBM TotalStorage UltraScalable Tape Library 3584 can use a Fibre Channel interface (also called a *port*). In accordance with the standards of the American National Standards Institute (ANSI), the port runs Fibre Channel Protocol (which includes SCSI commands on the Fibre Channel) with ANSI-defined Fibre Channel Tape Support. The method by which the drive and server communicate is determined by the type of topology in which they reside and the type of connection that you choose.

Your IBM Service Representative must perform setup and Fibre Channel configuration of the library. The following information is for reference only.

Physical Characteristics of the Fibre Channel Interface

Each Ultrium Tape Drive in an UltraScalable Tape Library contains one Fibre Channel interface (called a port). The Fibre Channel port runs the SCSI protocol with Fibre Channel tape support.

Cables and Speeds

Ultrium 1 Tape Drives use SC duplex fiber optics cables; Ultrium 2 Tape Drives use LC duplex fiber optics cables.

The maximum distances that the UltraScalable Tape Library supports on a Fibre Channel link is determined by the link speed, the type of fiber (50 micron or 62.5 micron), and the device to which the library is attached.

If the library attaches to an HBA, refer to the distances that are supported by the HBA. If the library attaches to a switch, the supported distances are:

- For a 50-micron cable:
  - 1-Gb link speed = up to 500 m (1640 ft)
  - 2-Gb link speed = up to 300 m (984 ft)
- For a 62.5-micron cable:
  - 1-Gb link speed = up to 175 m (574 ft)
  - 2-Gb link speed = up to 150 m (492 ft)

The UltraScalable Tape Library uses 50-micron cables internally. Therefore, you must use a 50-micron cable to attach to the library's port. To attach to a 62.5-micron SAN, you must attach the 50-micron cable to an active port, such as a port on a switch.

The cable connections between each drive and each server are housed in a patch panel that is located at the rear of the base frame or at the rear of any expansion frame that contains drives.

Supported Topologies

Fibre Channel devices (such as the UltraScalable Tape Library and a server) are known as nodes and have at least one port through which to receive and send data. The collection of components that connect two or more nodes is called a topology. Fibre Channel systems consist solely of two components: nodes with ports and topologies.

Each port uses a pair of fibers: one fiber carries data into the port, and the other carries data out of the port. The fibers in the channel are optical strands. The fiber pair is called a link and is part of the topology. Data is transmitted over the links in units known as frames. A frame contains an address identifier that gives the fabric and node for which the frame is destined.

The UltraScalable Tape Library can be attached in a two-node configuration, either directly to a switch as a public device (switched fabric) or directly to a host bus adapter (HBA) as a private device. Depending on whether it has been attached through an Ultrium 1 or 2 Tape Drive, or configured by using vital product data (VPD) settings, the library automatically configures to an L_port or an N_port when it boots. The type of connection also depends on whether the drive recognizes the connection as a loop or a point-to-point connection:

- An L_port supports a Fibre Channel Arbitrated Loop connection to an NL_port or FL_port.
- An N_port supports direct connection to an F_port (for example, a director-class switch) in a point-to-point topology.

Regardless of the port to which you connect the drive, it automatically configures to a public device (through an F_port or FL_port to a switch) or to a private device (through an L_port by using direct attachment to a server).

The UltraScalable Tape Library supports two topologies: two-node switched fabric and two-node direct connection. Table 25 lists the topologies in which the library can operate, the Fibre Channel server connections that are available, and the port (NL, N, FL, or F) through which communication must occur. The sections that follow describe each topology.

Table 25. Choosing the port and topology through which your Fibre Channel connection can be made

Type of Topology	Type of Fibre Channel Connection to Server	
	Direct Connection (Private)	**Switched Fabric (Public)**
Ultrium 2		
Point-to-Point (two nodes)	N_Port (not supported)	F_Port
Ultrium 1 and 2		
Fibre Channel-Arbitrated Loop (can be Two-Node Arbitrated Loop or Two-Node Switched Fabric Loop; is limited to two nodes)	L_Port	FL_Port

Two-Node Switched Fabric Topology

Two or more Fibre Channel end points can interconnect through a device called a switch. The Fibre Channel architecture supports up to 256 ports through each switch.

A switched fabric allows all of its ports to simultaneously use the Fibre Channel's full architectural bandwidth. To determine the switches to which you can directly attach the UltraScalable Tape Library, visit the web at:

`http://ssddom02.storage.ibm.com/techsup/webnav.nsf/support/san`

Switches include a function called zoning. This function allows you to partition the switch's ports and share access to a drive. For more information about sharing access, see "Sharing on a Storage Area Network" on page 240).

The two-node switched fabric topology supports two protocols:

- Use the two-node switched fabric loop protocol when attaching the library to an FL_port. This protocol is supported when you attach the library through the Ultrium 1 or Ultrium 2 Tape Drive.
- Use the two-node switched fabric point-to-point protocol when attaching the library to an F_port. This protocol is supported when you attach the library through the Ultrium 2 Tape Drive.

Two-Node Direct Connection Topology

A two-node direct connection occurs when two Fibre Channel end points are connected together. The difference is in the protocol. When only two Fibre Channel end points connect together, both end points must use the same protocol.

Therefore, when only two Fibre Channel end points connect together, either protocol is usable. Both end points must, however, use the same protocol. Most Fibre Channel adapters default to the loop protocol when not directly connected to a fabric.

Use the two-node direct connection protocol when attaching the library to an L_port. This protocol is supported when you attach the library through the Ultrium 1 or Ultrium 2 Tape Drive. The two-node direct connection protocol for attaching the library to an N_port is not supported.

Fibre Channel Addressing

Each Ultrium Tape Drive in an UltraScalable Tape Library must have a Loop ID and corresponding Arbitrated Loop Physical Address (AL_PA) to communicate in a Fibre Channel topology. Table 26 lists the default Loop IDs and AL_PAs for each drive in the library.

The AL_PAs defined here are used when connecting to other devices in Arbitrated Loop topology only. When connected in a switched fabric point-to-point topology, the AL_PA is assigned by the fabric and these AL_PAs are not used.

Table 26. Default Loop IDs and their associated AL_PAs for Ultrium Tape Drives in the IBM TotalStorage UltraScalable Tape Library 3584

Drive	Frames 1, 7, 13		Frames 2, 8, 14		Frames 3, 9, 15		Frames 4, 10, 16		Frames 5, 11		Frames 6, 12	
	Loop ID	AL_PA	Loop ID	AL_PA	Loop ID	AL_PA	Loop ID	AL_PA	Loop ID	AL_PA	Loop ID	AL_PA
Row 1	17	X'CC'	33	X'B1'	49	X'97'	65	X'71'	81	X'54'	97	X'39'
Row 2	18	X'CB'	34	X'AE'	50	X'90'	66	X'6E'	82	X'53'	98	X'36'
Row 3	19	X'CA'	35	X'AD'	51	X'8F'	67	X'6D'	83	X'52'	99	X'35'
Row 4	20	X'C9'	36	X'AC'	52	X'88'	68	X'6C'	84	X'51'	100	X'34'
Row 5	21	X'C7'	37	X'AB'	53	X'84'	69	X'6B'	85	X'4E'	101	X'33'
Row 6	22	X'C6'	38	X'AA'	54	X'82'	70	X'6A'	86	X'4D'	102	X'32'
Row 7	23	X'C5'	39	X'A9'	55	X'81'	71	X'69'	87	X'4C'	103	X'31'
Row 8	24	X'C3'	40	X'A7'	56	X'80'	72	X'67'	88	X'4B'	104	X'2E'
Row 9	25	X'BC'	41	X'A6'	57	X'7C'	73	X'66'	89	X'4A'	105	X'2D'
Row 10	26	X'BA'	42	X'A5'	58	X'7A'	74	X'65'	90	X'49'	106	X'2C'
Row 11	27	X'B9'	43	X'A3'	59	X'79'	75	X'63'	91	X'47'	107	X'2B'
Row 12	28	X'B6'	44	X'9F'	60	X'76'	76	X'5C'	92	X'46'	108	X'2A'

Note: Loop IDs are given in decimal format and AL_PA values are given in hexadecimal format.

You can change a Loop ID by using the library's operator panel or UltraScalable Specialist web interface (see "Changing the SCSI ID or Loop ID of a Drive or Control Port" on page 139). Using a method called hard addressing, the drive then automatically selects the corresponding AL_PA, which is the identifier that devices use to communicate. Valid Loop ID values range between 0 and 125. The higher the number of the Loop ID (which relates to AL_PA), the higher the priority of the device in the loop.

You can also specify Loop IDs that allow the drive to dynamically arbitrate the AL_PA with other Fibre Channel devices on the loop. This method avoids conflicts over the address and is called soft addressing. To dynamically arbitrate the AL_PA, specify a Loop ID of 126 or 127.

For a complete list of Loop IDs and their corresponding AL_PAs, see Table 27 on page 237.

Table 27. Valid Loop IDs and their associated AL_PAs for Ultrium Tape Drives in the IBM TotalStorage UltraScalable Tape Library 3584

7-bit Loop ID (decimal)	8-bit AL_PA (hexadecimal)	7-bit Loop ID (decimal)	8-bit AL_PA (hexadecimal)	7-bit Loop ID (decimal)	8-bit AL_PA (hexadecimal)
0	X'EF'	43	X'A3'	86	X'4D'
1	X'E8'	44	X'9F'	87	X'4C'
2	X'E4'	45	X'9E'	88	X'4B'
3	X'E2'	46	X'9D'	89	X'4A'
4	X'E1'	47	X'9B'	90	X'49'
5	X'E0'	48	X'98'	91	X'47'
6	X'DC'	49	X'97'	92	X'46'
7	X'DA'	50	X'90'	93	X'45'
8	X'D9'	51	X'8F'	94	X'43'
9	X'D6'	52	X'88'	95	X'3C'
10	X'D5'	53	X'84'	96	X'3A'
11	X'D4'	54	X'82'	97	X'39'
12	X'D3'	55	X'81'	98	X'36'
13	X'D2'	56	X'80'	99	X'35'
14	X'D1'	57	X'7C'	100	X'34'
15	X'CE'	58	X'7A'	101	X'33'
16	X'CD'	59	X'79'	102	X'32'
17	X'CC'	60	X'76'	103	X'31'
18	X'CB'	61	X'75'	104	X'2E'
19	X'CA'	62	X'74'	105	X'2D'
20	X'C9'	63	X'73'	106	X'2C'
21	X'C7'	64	X'72'	107	X'2B'
22	X'C6'	65	X'71'	108	X'2A'
23	X'C5'	66	X'6E'	109	X'29'
24	X'C3'	67	X'6D'	110	X'27'
25	X'BC'	68	X'6C'	111	X'26'
26	X'BA'	69	X'6B'	112	X'25'
27	X'B9'	70	X'6A'	113	X'23'
28	X'B6'	71	X'69'	114	X'1F'
29	X'B5'	72	X'67'	115	X'1E'
30	X'B4'	73	X'66'	116	X'1D'
31	X'B3'	74	X'65'	117	X'1B'
32	X'B2'	75	X'63'	118	X'18'
33	X'B1'	76	X'5C'	119	X'17'
34	X'AE'	77	X'5A'	120	X'10'
35	X'AD'	78	X'59'	121	X'0F'
36	X'AC'	79	X'56'	122	X'08'
37	X'AB'	80	X'55'	123	X'04'
38	X'AA'	81	X'54'	124	X'02'
39	X'A9'	82	X'53'	125	X'01'
40	X'A7'	83	X'52'	126	X'00'
41	X'A6'	84	X'51'	127	– –
42	X'A5'	85	X'4E'	– –	– –

LUN Assignments

The logical unit number (LUN) for the Sequential Access device is always LUN 0 of the drive, and the LUN for the Medium Changer device is always LUN 1 (all other LUNs are invalid addresses). These devices are compatible with the SCSI-2 or SCSI-3 standard. For information about the SCSI commands for the tape drive and the library, see the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference* and the *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*.

Note: The Medium Changer SCSI ID is the same as the SCSI ID for Drive 1, Frame 1. You can enable additional drives to optionally provide Medium Changer (LUN 1) addressing by configuring more than one logical library or by enabling additional control paths (see "Configuring the Library with Partitions" on page 123 or "Changing a Control Path" on page 148).

Using World Wide Names

Normally, blocks of World Wide Name (WWN) addresses are assigned to manufacturers by the IEEE Standards Committee, and are built into devices during manufacture. In the case of the UltraScalable Tape Library, however, the library assigns World Wide Node Names and World Wide Port Names to the drives. This technique is referred to as "library-centric world wide names." Potential drive slots are each assigned a WWN which does not change when a drive is swapped or replaced.

In the UltraScalable Tape Library, a WWN for a drive is implemented through an algorithm that uses the frame serial number of the library and the drive's position within the library. The WWN of the drive is location-dependent and not device-dependent. That is, each time that the drive is reset or powered on, the library reestablishes the WWN so that a drive in frame x, row y always keeps the same WWN, even if the drive is replaced. The design of a WWN is such that if a drive needs service or replacement, host parameters do not need to be changed or reconfigured. The library's configuration can also easily survive a reboot. The following sections describe methods that involve World Wide Names in resolving these issues.

Using Persistent Binding to Ensure SCSI ID Assignment

When a server is booted, devices are discovered and assigned SCSI target and LUN IDs. It is possible for these SCSI assignments to change between boots. Some operating systems do not guarantee that devices will always be allocated the same SCSI target ID after rebooting. Also, some software depends on this association, so you do not want it to change. The issue of SCSI ID assignment is addressed by persistent binding.

Persistent binding is an HBA function that allows a subset of discovered targets to be bound between a server and device. Implemented by a WWNN or WWPN, persistent binding causes a tape drive's WWN to be bound to a specific SCSI target ID. After a configuration has been set, it survives reboots and any hardware configuration changes because the information is preserved. If a drive needs to be replaced, the new drive assumes the WWNN of the old drive because the WWNN for the drive is location-dependent within the library. Because the WWNN does not change, persistent binding does not need to be changed which would cause an outage.

Using Zoning to Isolate Devices and Enhance Security

For security reasons, it is important to limit the devices that a server or servers can recognize or access. Also, some performance configurations and SAN configurations can result in a device being seen multiple times from the same server. For example, if you have two HBAs from the same server connected to an Ultrium Tape Drive in the library, the drive will be detected and appear as two logical devices. That is, there will be two special files for one physical device. Zoning can address these issues.

Zoning allows you to partition your SAN into logical groupings of devices so that each group is isolated from the other and can only access the devices in its own group. Two types of zoning exist: hardware zoning and software zoning. Hardware zoning is based on physical fabric port number. Software zoning is defined with WWNN or WWPN. While zoning can be reconfigured without causing an outage, some zoning configurations can become complicated. The advantage of the library's WWNN implementation is that you can avoid the exposure of introducing zoning errors because you do not have to change the zoning configuration if a drive needs service or replacement.

Connectors and Adapters

The UltraScalable Tape Library is supported by a wide variety of servers (hosts), operating systems, and adapters. These attachments can change throughout the product's life cycle. To determine the latest attachments, visit the web at `http://ssddom02.storage.ibm.com/techsup/webnav.nsf/support/3584` or contact your IBM Sales Representative.

Connecting to the iSeries Server

The OS/400 operating system supports a maximum of:

- 90 tape drives per logical library
- 32 tape drives per iSeries (AS/400) server

The iSeries does not require or allow you to set the Fibre Channel adapter settings. The adapter automatically detects the connection type and device addressing. OS/400 support is as follows:

- For V5R1, the adapter supports:
  - A single target with multiple LUNs
  - 1-Gb/s connection
  - For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
  - Does not support fabric
- For V5R2, the adapter supports:
  - Up to 16 devices, including multiple targets and multiple LUNs (each LUN on each target counts as a device)
  - 2-Gb/s connection (but will negotiate down to 1 Gb/s if necessary)
  - For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
  - For a point-to-point topology, connection through an N_port to an F_port

The iSeries Fibre Channel adapter does not support D-mode Alternate IPL. The Alternate Installation function is used to restore a system from a Fibre Channel-attached device. With Alternate Installation support, the system is loaded

from a CD and directed to the Fibre Channel-attached device for a restore from the tape that contains the saved data. The code on the CD is only used to get the restore from tape started. All code and program temporary fixes (PTFs) are restored from the tape that contains the saved data.

Sharing on a Storage Area Network

With Storage Area Network (SAN) components, the possibilities for connecting multiple systems and multiple drives have increased. Not all software and systems are designed to share drives. Before you install a drive that would allow two systems to share it, check that the systems and their software support sharing. If your software does not support sharing, note that Fibre Channel switches have a zoning capability to form a SAN partition. For systems that do not cooperate, use zoning to prevent the systems from sharing the same drive. You can remove zoned partitions as you upgrade software and system levels.

Chapter 8. Using the SCSI Interface

Your IBM Service Representative must perform the setup and SCSI configuration of the IBM TotalStorage UltraScalable Tape Library 3584. The following information is for reference only.

Physical Characteristics of the SCSI Interface

The UltraScalable Tape Library operates as a set of SCSI-2 or SCSI-3 devices. An Ultrium Tape Drive attaches to a server through an LVD Ultra160 SCSI or an HVD Ultra SCSI interface; a DLT 8000 Tape System attaches to a server through a Fast/Wide LVD or HVD interface. Each SCSI drive canister uses shielded, VHDCI, 68-pin connectors, and can attach directly to a 2-byte-wide SCSI cable.

Note: The earlier version of the SCSI drive uses HD68 connectors. The HD68 drive is packaged on a tray (sled) and has been withdrawn from marketing. For more information, see Appendix E, “Feature Codes”, on page 283.

Any combination of up to two initiators (servers) and up to four targets (devices) is allowed on a single SCSI bus if the following conditions are met:

- The SCSI bus is terminated properly at each end
- Cable restrictions are followed according to the SCSI-3 specification

Under the SCSI-3 protocol, this type of attachment allows cable lengths of up to 25 m (81 ft) with the appropriate cable and terminator. Table 28 gives the maximum bus length between terminators for the LVD and HVD interfaces. For information about cable connectors, see “SCSI Connectors and Adapters” on page 244.

Table 28. Maximum bus length between terminators

Type of Interconnection	Maximum Bus Length Between Terminators (in meters)
Point-to-point (1 server and 1 drive)	25
Multi-drop/daisy-chain (1 server and multiple drives)	12 (LVD)
	25 (HVD)

For maximum performance, multiple SCSI buses may be required (see “Using Multiple SCSI Buses” on page 243), and IBM Ultrium Tape Drives must be the only target devices that are active on the bus.

Note: For maximum performance, the quantity of tape drives that you can attach to one SCSI bus is limited, and is based on the type of bus that you have and the amount of data compression achieved. Ultra SCSI buses have a bandwidth of 40 MB per second; Ultra2 SCSI buses have a bandwidth of 80 MB per second; Ultra160 SCSI buses have a bandwidth of 160 MB per second. Table 29 on page 242 lists the types of SCSI buses and gives the recommended maximum quantity of drives that you can attach.

Table 29. Recommended maximum quantity of drives per SCSI bus

Type of Drive	Type of SCSI Bus			
	Fast/Wide	**Ultra**	**Ultra2**	**Ultra160**
HVD Ultrium 1 or 2 (for AS/400 or iSeries; see Note 1)	N/A (see Note 2)	1	N/A	N/A
LVD Ultrium 2	N/A	1	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)
LVD Ultrium 1	N/A	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)	4 (2 drives at 2:1 compression)
DLT 8000 Tape System	3 (2 drives at 2:1 compression)	N/A	N/A	N/A

Notes:

1. If you are using an IBM AS/400 or IBM iSeries, you can attach only one HVD Ultrium 1 Tape Drive to the SCSI bus.
2. N/A = not applicable.

Default SCSI ID Assignments

Based on its physical position in the frame, each tape drive and control port is assigned a default SCSI ID (from 0 to 13). Table 30 lists the default SCSI IDs.

Table 30. Default SCSI ID for each drive or control port in the IBM TotalStorage UltraScalable Tape Library 3584

Device Position	SCSI ID
Row 0 (control port only)	13
Row 1	0
Row 2	1
Row 3	2
Row 4	3
Row 5	4
Row 6	5
Row 7	6
Row 8	8
Row 9	9
Row 10	10
Row 11	11
Row 12	12

Note: You can change a SCSI ID by using the UltraScalable Specialist web interface or the operator panel. For more information, see “Changing the SCSI ID or Loop ID of a Drive or Control Port” on page 139.

LUN Assignments for Ultrium Tape Drives

The logical unit number (LUN) for the Sequential Access device is always LUN 0 of the drive, and the LUN for the Medium Changer device is always LUN 1 (all other LUNs are invalid addresses). These devices are compatible with the SCSI-2 or SCSI-3 standard. For information about the SCSI commands for the tape drive and the library, see the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference* and the *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*.

Note: The Medium Changer SCSI ID is the same as the SCSI ID for Drive 1, Frame 1. You can enable additional drives to optionally provide Medium Changer (LUN 1) addressing by configuring more than one logical library or by enabling additional control paths (see “Configuring the Library with Partitions” on page 123 or “Changing a Control Path” on page 148).

LUN Assignments for DLT 8000 Tape Systems and Control Ports

The logical unit number (LUN) for the Sequential Access device is always LUN 0 of the drive, and the LUN for the Medium Changer device is always LUN 0 of each control port (all other LUNs are invalid addresses). These devices are compatible with the SCSI-2 or SCSI-3 standard. For information about the SCSI commands for the tape drive and the library, see the *Quantum DLT 8000 Tape System Product Manual* and the *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*.

Using Multiple SCSI Buses

The UltraScalable Tape Library has two SCSI connectors for each tape drive in the library. Each drive can be daisy-chained using a SCSI bus jumper that is included with each tape drive.

Removal of any jumpers will create up to 12 SCSI buses per frame for attachment to multiple servers or to multiple SCSI adapter cards on one server. Multiple SCSI buses may be required for maximum performance, depending on the application and data compression ratio. Note, however, that library (Medium Changer) control is required on at least one SCSI bus.

The Medium Changer device is required to be addressed via LUN 1 of the lowest-numbered drive position of each logical library. The Medium Changer device may additionally be addressed via LUN 1 of other drives in any logical library.

Any bus containing a Medium Changer device via LUN 1 of a drive is referred to as a control and data path. Any other bus is referred to as a data path. For information about control paths, see “Library Sharing” on page 14.

Terminating the Bus

The SCSI bus and all of the wires in the SCSI cable must be properly terminated according to the SCSI standard.

You can mount an external terminator into one of the SCSI connectors. A terminator must be installed on the last device on each end of a string of multiple devices. A terminator is included with each Ultrium Tape Drive and DLT 8000 Tape System.

SCSI Connectors and Adapters

The UltraScalable Tape Library is supported by a wide variety of servers (hosts), operating systems, and adapters. These attachments can change throughout the product's life cycle. To determine the latest attachments, visit the web at `http://www.storage.ibm.com/hardsoft/tape/3584/3584opn.pdf` or contact your IBM Sales Representative.

Notes on Connecting to the AS/400 and iSeries Servers

The following conditions apply to the SCSI bus attachment of the UltraScalable Tape Library to the IBM AS/400 and the IBM iSeries servers. (Feature codes in the following list are abbreviated as FC.)

- An interposer (FC 2895 for the UltraScalable Tape Library) is required to connect the library's tape drives to the Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only). No interposers are required to connect the library's tape drives to the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), or Magnetic Media Controller (FC 6534).
- The PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), and Magnetic Media Controller (FC 6534) provide one port.
- The Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only) provides two ports, but one port must remain unused when connecting the UltraScalable Tape Library. Each port can support one or two of the library's tape drives, but only one is recommended for optimum performance.
- When the UltraScalable Tape Library's tape drives are attached, no other devices can be supported on the ports for the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), or Magnetic Media Controller (FC 6534).
- An AS/400 or iSeries server cannot be interconnected with any other server (including another AS/400 or iSeries server) on the same SCSI bus.
- For the UltraScalable Tape Library to be shared by an AS/400 or iSeries server and another type of server at the same time, the library must be configured with multiple logical libraries (see "Library Sharing" on page 14).
- For the UltraScalable Tape Library to be shared by two or more AS/400 or iSeries servers at the same time, the library must be configured with multiple control paths (see "Using Multiple Control Paths" on page 18).
- If you plan to use the UltraScalable Tape Library as an alternate IPL device, you must set one of the SCSI addresses on its tape drives to 0 when you attach it with the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), Magnetic Media Controller (FC 6534), or 5702 adapter.
- Maximum performance by the Ultrium 2 Tape Drive cannot be achieved with HVD SCSI. No increase in performance is expected by replacing HVD Ultrium 1 Tape

Drives with HVD Ultrium 2 Tape Drives. Maximum performance can only be achieved with LVD SCSI or Fibre Channel attachment.

- LVD SCSI is supported with OS/2® V5R2 and the 5702 adapter. The 5702 uses Ultra160 SCSI technology and VHDCI cable connectors. Multiple Ultrium 2 Tape Drives can be attached to one 5702 adapter, but performance must be taken into consideration. Each iSeries adapter must have at least one control path configured with the attached drives. The LVD Ultrium 1 Tape Drives are not supported.
- Multiple HVD SCSI Ultrium 2 Tape Drives can be attached to the Magnetic Media Controller (FC 6534), PCI Magnetic Media Controller (FC 2729), or PCI Ultra Magnetic Media Controller (FC 2749) adapters, but performance must be taken into consideration. The HVD Ultrium 1 Tape Drive is limited to one drive per iSeries adapter. Each iSeries adapter must have at least one control path configured with the attached drives.

Chapter 9. Problem Determination

Use the information in this chapter to assess symptoms and resolve possible problems with the IBM TotalStorage UltraScalable Tape Library 3584. If you are connected to an SNMP monitoring station, this chapter also helps you to analyze problems identified by SNMP traps.

Resolving Errors

Table 31 lists symptoms or errors that could occur and give the required corrective actions.

Table 31. Resolving errors with the IBM TotalStorage UltraScalable Tape Library 3584

Symptom or Error	Action
The library is powered off. All of the following conditions are true: • The touchscreen LCD is blank. • The power-on indicator is not lit. • The library and all of the drives do not respond to host commands.	1. Ensure that the library's power is turned on (the power-on switch is positioned to I). 2. Ensure that the library's power cord is plugged into the wall receptacle. **Note:** Each frame could have a separate power cord. 3. Ensure that the power receptacle (into which the library's power cord is plugged) is active (for example, ensure that a circuit breaker is not tripped or turned off). 4. If the problem still exists, call your IBM Service Representative.
A message displays on the touchscreen and indicates that a front door is open.	1. Ensure that all front doors are closed and properly latched. 2. If the problem still exists, open and close each front door. 3. If the problem still exists, call your IBM Service Representative.
A message displays on the touchscreen and indicates that the door of the I/O station is open or the I/O station is full of cartridges.	1. If the message indicates that the door of the I/O station is open, close the door. 2. If the message indicates that the I/O station is full of cartridges, open the I/O station door, remove the cartridges, and close the door. 3. If the problem still exists, call your IBM Service Representative.
A message displays on the touchscreen and indicates that a cleaning cartridge has expired.	Usage of the cleaning cartridge has exceeded a specified threshold. To replace the cleaning cartridge, see "Removing a Cleaning Cartridge from the Library" on page 86 and "Inserting a Cleaning Cartridge into the Library" on page 80. To order cleaning cartridges, see "Ordering Media Supplies" on page 215.
A message displays on the touchscreen and indicates that a drive needs to be cleaned.	1. Ensure that a cleaning cartridge is present in the library inventory. To insert a cleaning cartridge, see "Inserting a Cleaning Cartridge into the Library" on page 80. 2. Ensure that automatic cleaning is set correctly. To enable automatic cleaning, see "Enabling or Disabling Automatic Cleaning" on page 78. 3. If the host application is responsible for cleaning the drives, ensure that a cleaning cartridge is in the same logical library as the drive to be cleaned. 4. If the problem still exists, manually clean the drive (see "Performing a Manual Cleaning Operation" on page 84).
An error message displays on the touchscreen.	1. Record the error message, as well as any error codes, locations, and so forth. 2. Press MENU. The library removes the error message from the touchscreen. 3. Call your IBM Service Representative.

Table 31. Resolving errors with the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Symptom or Error	Action
Fibre Channel Communications Problem. The host is unable to communicate with one or more Fibre Channel devices in the library.	1. Ensure that all Fibre Channel cables from the host to the library are securely connected at both ends. 2. If multiple Fibre Channel drives exist on a single loop (as when multiple drives are connected to a hub), ensure that each device on the loop has a unique loop ID (see “Fibre Channel Addressing” on page 236). 3. Ensure that all Fibre Channel host adapters are supported (for a list of supported adapters, visit the web at `http://www.storage.ibm.com/tape/lto/3584/3584opn.pdf` or contact your IBM Sales Representative). 4. Ensure that the appropriate levels of device driver are installed and that any other prerequisites are satisfied (see “Supported Device Drivers” on page 20). 5. If you are connecting through a SAN Data Gateway, ensure that the gateway has the appropriate level of firmware installed (see Note at end of table). 6. Some Fibre Channel devices (such as the SAN Data Gateway, or routers and switches) provide diagnostic routines that show all of the devices that are attached to them. Refer to the device documentation for details about the routines. If a Fibre Channel device that is positioned between the host and the library can see the library’s devices, the problem is probably between the Fibre Channel device and the host. 7. Ensure that the host is configured with the correct World Wide Node Name or World Wide Port Name (see “Using World Wide Names” on page 238). 8. Refer to the documentation for the device driver that you are using. If you are using the IBM Ultrium Device Drivers, refer to *IBM Ultrium Device Drivers Installation and User’s Guide*. Review the Problem Determination procedures in the device driver documentation. Ensure that the device driver is loaded and that it can communicate with the tape drives: • If the device driver is not loaded, install it. • If the device driver is loaded but cannot communicate with the tape drives, call your IBM Service Representative. • If the device driver is loaded and can communicate with the tape drives, but the application software cannot communicate with the tape drives, contact the provider of your application software for assistance.

Table 31. Resolving errors with the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Symptom or Error	Action
SCSI Communications Problem. The host is unable to communicate with one or more SCSI devices in the library.	1. Ensure that all SCSI cables from the host to the library are securely connected at both ends. 2. Ensure that each SCSI bus is properly terminated (the bus is terminated at the SCSI host adapter card and at the last drive on the bus). 3. For each SCSI bus, ensure that all devices on the bus have a unique SCSI address. No two drives or control ports can have the same SCSI ID, and no drive can use the SCSI ID that is used by the SCSI host adapter (see "Default SCSI ID Assignments" on page 242). **Note:** Unless an RS/6000® High Availability (HA) configuration is used, the SCSI host adapter is typically set to SCSI ID 7. In an HA configuration, one SCSI host adapter is set to SCSI ID 5, the second SCSI host adapter is set to SCSI ID 6, and SCSI ID 7 is reserved. 4. Ensure that all SCSI host adapters, SCSI terminators, drives, and control ports on a single SCSI bus are compatible. For example, if a library contains LVD drives, you must use LVD terminators and LVD SCSI host adapters. Similarly, if the library contains HVD drives, you must use HVD terminators and HVD SCSI host adapters. 5. If there is any Fibre Channel equipment between the host and a SCSI tape drive, perform the following tasks: a. Follow steps 1 through 7 on page 248. b. Ensure that the host is configured with the correct Loop ID or AL_PA (see "Fibre Channel Addressing" on page 236). 6. Refer to the documentation for the device driver that you are using. If you are using the IBM Ultrium Device Drivers, refer to *IBM Ultrium Device Drivers Installation and User's Guide*. Review the Problem Determination procedures in the device driver documentation. Ensure that the device driver is loaded and that it can communicate with the tape drives: • If the device driver is not loaded, install it. • If the device driver is loaded but cannot communicate with the tape drives, call your IBM Service Representative. • If the device driver is loaded and can communicate with the tape drives, but the application software cannot communicate with the tape drives, contact the provider of your application software for assistance. 7. Ensure that the SCSI host adapter settings are correct. The following SCSI host adapter settings are necessary: • Wide SCSI must be enabled. • Disconnect must be allowed. • Multiple LUN support must be enabled (for any SCSI host adapter that connects to an Ultrium Tape Drive which serves as a control path). 8. Refer to the documentation for the device driver that you are using. If you are using the IBM Ultrium Device Drivers, refer to *IBM Ultrium Device Drivers Installation and User's Guide*. Review the Problem Determination procedures in the device driver documentation. Ensure that the device driver is loaded and that it can communicate with the tape drives: • If the device driver is not loaded, install it. • If the device driver is loaded but cannot communicate with the tape drives, call your IBM Service Representative. • If the device driver is loaded and can communicate with the tape drives, but the application software cannot communicate with the tape drives, contact the provider of your application software for assistance.

Table 31. Resolving errors with the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Symptom or Error	Action
The host application software indicates that a cartridge is write protected.	1. Record the host message, including any information about which cartridge has the problem. 2. Use the application software to move the cartridge to the I/O station. 3. Open the door of the I/O station and remove the cartridge. 4. Set the write-protect switch on the cartridge to enable writing (for LTO Ultrium cartridges, see "Setting the Write-Protect Switch" on page 202; for DLT cartridges, see "Setting the Write-Protect Switch" on page 228). 5. Insert the cartridge back into the I/O station and close the door. 6. Use the application software to move the cartridge back into the library.
The host application software indicates that there is a problem with the cartridge.	1. Record the host message, including any information about which cartridge has the problem. 2. If possible, use the application software to copy data from the failing cartridge to another cartridge. 3. Use the application software to move the cartridge to the I/O station. **Note:** If the cartridge is stuck (in a drive, gripper or storage slot) call your IBM Service Representative. 4. Open the door of the I/O station and remove the failing cartridge. 5. Close the door of the I/O station.
The host application software indicates that there is a problem with the bar code on the cartridge.	1. Record the host message, including any information about which cartridge has the problem. 2. Use the application software to move the cartridge to the I/O station. 3. Open the door of the I/O station and remove the cartridge. 4. Check for a loose, damaged, or misaligned bar code label (for LTO Ultrium cartridges, see "Bar Code Label" on page 200; for DLT cartridges, see "Bar Code Label" on page 222). If there is an obvious problem, correct it. You may need to apply a new bar code label. 5. When the problem is corrected, insert the cartridge back into the I/O station and close the door. 6. Use the application software to move the cartridge back into the library. 7. If the problem still exists, call your IBM Service Representative.
The host application software indicates that there is a problem with the library inventory. For example, a move operation failed because: • The cartridge was not found. • The source location was empty. • The destination location was full.	1. Record the host message, including any information about which cartridges have the problem. 2. Use the host application software to inventory the library. Depending on which application is used, an inventory may be called *inventory*, *initialize element status*, *audit*, *remap*, or *rebuild index*. 3. If the problem still exists, perform an inventory of the entire library from the library's operator panel (see "Performing an Inventory of the Library" on page 106). 4. If the problem still exists, call your IBM Service Representative.
The host application software indicates that a drive has failed.	1. Record the error message and any error codes. 2. Retry the job (if possible, use a different cartridge; many problems that are reported as drive failures are caused by media defects). • If the retry with a different cartridge is successful, consider the original cartridge defective. If necessary, copy the data from the cartridge and remove it from the library (see "Removing Data Cartridges from the Library" on page 75). • If the retry with a different cartridge fails, call your IBM Service Representative.

Table 31. Resolving errors with the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Symptom or Error	Action
The host application software indicates that the library failed.	1. Record the error message and any error codes. 2. Check the library's touchscreen for any error messages. If an error message is displayed, record it and any error codes. 3. Call your IBM Service Representative.
The library is powered on, but the touchscreen is blurry, unreadable, or blank.	Call your IBM Service Representative.
The touchscreen is readable, but the touch keys do not work.	Call your IBM Service Representative.
Note: If your library uses drives with Fibre Channel interfaces and connects through a SAN Data Gateway, ensure that the gateway has the appropriate level of firmware installed: • For Model 2108-R03, download firmware from `http://www.storage.ibm.com/hardsoft/products/tape/ro3superserver.htm` • For Model 2108-G07, download firmware from `http://www.storage.ibm.com/hardsoft/products/tape/tapesupport.htm`	

Interpreting SNMP Traps

The UltraScalable Tape Library can alert you to possible problems by using a TCP/IP LAN network that is connected to an SNMP monitoring station. These alerts are called SNMP traps. The monitoring station must be loaded with systems management software (such as Tivoli Netview) that can receive and process the trap, or the trap is discarded. After the trap received, it must be interpreted.

If you have systems management software that includes an SNMP compiler, you may not need to manually interpret SNMP traps but you will need the library's Management Information Base (MIB). The MIB contains units of information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. To obtain the MIB for the UltraScalable Tape Library, visit `ftp://ftp.software.ibm.com/storage/358x/3584/`. Windows users select `3584mib.zip` and Unix users select `3584mib.tar`. After you obtain the MIB, load it into your management application. When the application next receives an SNMP trap, it will compile it into human-readable form so that you can gather information about the error.

If you do not have systems management software that includes an SNMP compiler, you will need to manually interpret the SNMP traps. The section that follows describes this procedure.

Manually Interpreting an SNMP Trap

To manually interpret an SNMP trap:

1. Observe the trap when it is received by systems management software and identify its components. Figure 57 shows a sample SNMP trap. The trap consists of object identifiers (OIDs) on the left of the equal (=) sign and OID fields on the right.

   The characters 182 in the OID indicate that the device is an UltraScalable Tape Library. The OID fields contain values that will help you to determine the nature of the problem.

   Note: Not every trap contains every field.

```
1.3.6.1.4.1.2.6.182.1.2.11.1.0 = 3584 L32 1312345
1.3.6.1.4.1.2.6.182.1.2.21.1.0 = 04 44 00
1.3.6.1.4.1.2.6.182.1.2.31.1.0 = 90 80
1.3.6.1.4.1.2.6.182.1.2.41.1.0 = 24
1.3.6.1.4.1.2.6.182.1.2.51.1.0 = A4D0
1.3.6.1.4.1.2.6.182.1.2.61.1.0 = 01 00
1.3.6.1.4.1.2.6.182.1.2.71.1.0 = The library has detected an error in its inventory
1.3.6.1.4.1.2.6.182.1.2.81.1.0 = 0A1
1.3.6.1.4.1.2.6.182.1.2.91.1.0 = 6
1.3.6.1.4.1.2.6.182.1.2.101.1.0 = 12762L2
1.3.6.1.4.1.2.6.182.1.2.11.1.0 = 1
```

Figure 57. Sample SNMP trap. OIDs are on the left of the equal sign; OID fields are on the right. Values in the fields provide information about the problem.

2. Refer to Table 32 to determine the meaning of the values in the OID fields. Analyze the values to determine the problem.

Table 32. Fields in an SNMP trap. The fields are listed in the order in which they occur in an actual SNMP trap. Use the sample values to interpret the meaning of the example trap in Figure 57.

Object Identifier (OID)	Description of OID Field	Maximum Characters	Sample Value in Field
1.3.6.1.4.1.2.6.182.1.2.11.1.0	Machine type	4	3584
	Blank character	1	
	Model number	4	L32
	Blank character	1	
	Serial number	8	1312345
1.3.6.1.4.1.2.6.182.1.2.21.1.0	SCSI sense key	2	04
	Blank character	1	
	SCSI additional sense code (ASC)	3	44
	Blank character	1	
	SCSI additional sense code qualifier (ASCQ)	3	00
1.3.6.1.4.1.2.6.182.1.2.31.1.0	Hardware error code (HEC)	2	90
	Blank character	1	
	Hardware error code qualifier (HECQ)	3	80
1.3.6.1.4.1.2.6.182.1.2.41.1.0	TapeAlert number	2	24
1.3.6.1.4.1.2.6.182.1.2.51.1.0	Unit reference code (URC)	4	A4D0

Table 32. Fields in an SNMP trap (continued). The fields are listed in the order in which they occur in an actual SNMP trap. Use the sample values to interpret the meaning of the example trap in Figure 57 on page 252.

Object Identifier (OID)	Description of OID Field	Maximum Characters	Sample Value in Field
1.3.6.1.4.1.2.6.182.1.2.61.1.0	Failing frame number	2	01
	Blank character	1	
	Failing drive number	3	00
1.3.6.1.4.1.2.6.182.1.2.71.1.0	Text message	255	The library has detected an error in its inventory
1.3.6.1.4.1.2.6.182.1.2.81.1.0	Drive fault symptom code	4	0A1
1.3.6.1.4.1.2.6.182.1.2.91.1.0	Drive single-character display	1	6
1.3.6.1.4.1.2.6.182.1.2.101.1.0	Cartridge volume serial number (refers to the volser of the bar code label)	8	127962L2
1.3.6.1.4.1.2.6.182.1.2.111.1.0	Logical library number	3	1

To determine the meaning of the each OID field, use the following sources:

- For the SCSI sense key, ASC, and ASCQ, see the *IBM TotalStorage UltraScalable Tape Library 3584 SCSI Reference*.
- For the TapeAlert flags, see Appendix C, “TapeAlert Flags”, on page 265. (DLT TapeAlerts do not initiate SNMP traps.)
- For the URC, HEC, and HECQ, drive fault symptom code, and number in the drive’s single-character display, see the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information* guide.

In general, the library generates SNMP traps when it detects TapeAlert error conditions. Additionally, the library also generates SNMP traps under certain non-error conditions. These traps are also assigned a unique OID in the MIB. They are generated under the following non-error conditions:

- The I/O station is full for over an hour.
- The logical library is full for over an hour and contains no empty storage slots.
- The I/O station door is open for an extended period of time.
- There are no LTO Ultrium Cleaning Cartridges in the library (0 cleanings remain on the LTO Ultrium Cleaning Cartridges in library).
- There are no DLTtape IV Cleaning Cartridges in the library (0 cleanings remain on the DLTtape IV Cleaning Cartridges in library).
- An LTO Ultrium Cleaning Cartridge has expired (the number of cleanings that remain on the cartridge has decreased to 0).
- A DLTtape IV Cleaning Cartridge has expired (the number of cleanings that remain on the cartridge has decreased to 0).

Appendix A. Frame Capacity

Table 33, Table 34, and Table 35 list the quantity of LTO Ultrium Tape Cartridges and DLTtape IV Tape Cartridges that the library supports, depending on whether the Capacity Expansion Feature is installed, the upper and lower I/O stations are used, and a specified quantity of drives are installed. The tables give the native and compressed capacities of configurations that consist solely of Ultrium 2 cartridges and DLT cartridges.

Capacity of Model L32 Frame

Table 33. Quantity of storage slots and capacity for cartridges in Model L32 base frame. The quantity depends on whether the Capacity Expansion Feature is installed, whether the upper and lower I/O stations are used, and the quantity of drives in a frame.

Drives in Model L32 Frame	Slots in Model L32 Frame (without Capacity Expansion Feature)			Slots in Model L32 Frame (with Capacity Expansion Feature and 30 I/O Slots)			Slots in Model L32 Frame (with Capacity Expansion Feature and 10 I/O Slots)		
	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)
1-4	141	28.2	56.4	229	45.8	91.6	281	56.2	112.4
5-8	113	22.6	45.2	201	40.2	80.4	253	50.6	101.2
9-12	87	17.4	34.8	175	35.0	70.0	227	45.4	90.8

Capacity of Model D32 Frame

Table 34. Quantity of storage slots and capacity for cartridges in Model D32 expansion frame. The quantity depends on whether the Capacity Expansion Feature is installed, whether the upper and lower I/O stations are used, and the quantity of drives in a frame.

Drives in Model D32 Frame	Slots in Model D32 Frame		
	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)
0	440	88.0	176.0
1-4	423	84.6	169.2
5-8	409	81.8	163.6
9-12	396	79.2	158.4

Capacity of Model D42 Frame

Table 35. Quantity of storage slots and capacity for cartridges in D42 expansion frame. The quantity depends on whether the Capacity Expansion Feature is installed, whether the upper and lower I/O stations are used, and the quantity of drives in a frame.

Drives in Model D42 Frame	Slots in Model D42 Frame		
	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)
0	360	14.4	28.8
1-4	346	13.8	27.6
5-8	333	13.3	26.6
9-12	324	12.9	25.8

Appendix B. Technical Components

Figure 58 shows the technical components of the IBM TotalStorage UltraScalable Tape Library 3584. The sections that follow describe each component.

1	Rail assembly
2	Cartridge accessor
3	Dual-gripper transport mechanism
4	Accessor controller
5	Operator panel controller
6	Frame control assembly
7	Medium Changer card pack
8	Power supplies
9	Frame control box (FCB)
10	ac outlets
11	Circuit breakers
12	Incoming main ac power

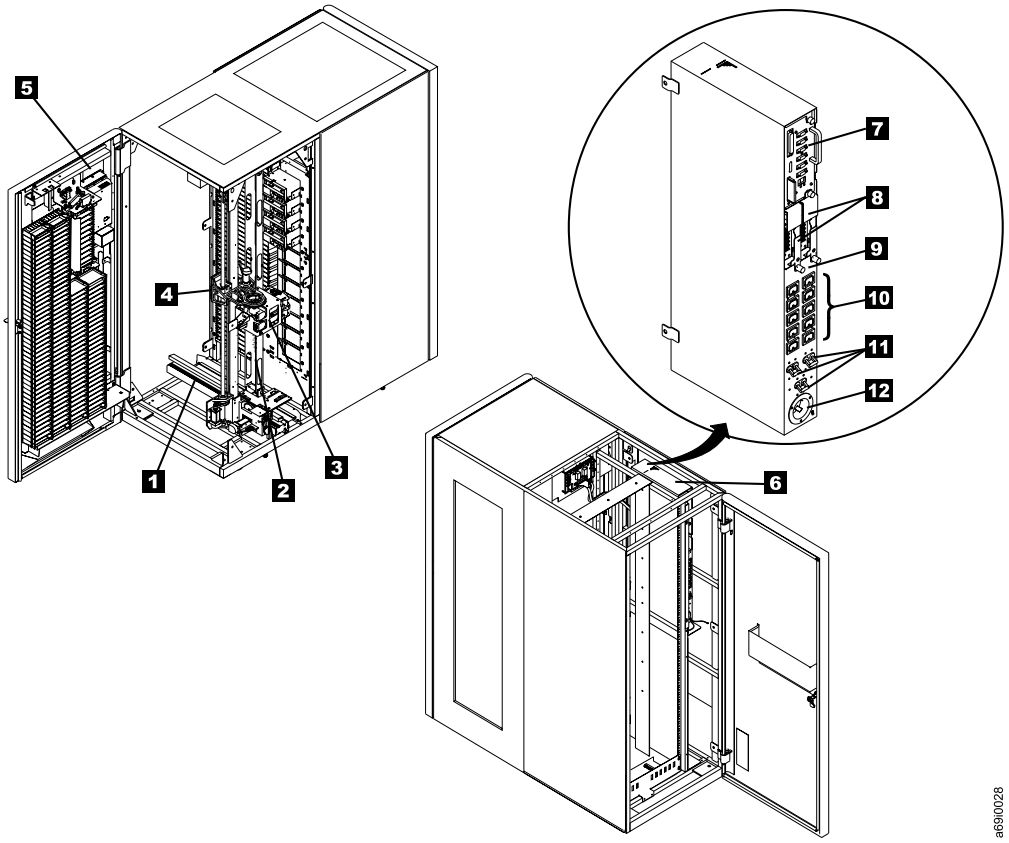

Figure 58. Technical components of the IBM TotalStorage UltraScalable Tape Library 3584

Rail Assembly

The cartridge accessor moves through the library on a rail assembly (**1** in Figure 58 on page 257). The system consists primarily of a main rail assembly and a support rail, and a trough for the power and control cable. The main rail assembly includes a main bearing way with a rack gear. Its support rail is an L-shaped rail that runs along the top of the frames and provides smooth transport for the cartridge accessor. The power and control cable is kept clear of the accessor in a covered trough located at the bottom rear of the library.

Cartridge Accessor

The cartridge accessor (**2** in Figure 58 on page 257) moves cartridges between the storage slots, tape drives, and the I/O station. The accessor consists of several components:

X- and Y-axis motion assemblies
A group of parts that includes a controller (circuit board) for the Controller Area Network interface, servo motor, pinion drive gear and lead screw. These assemblies provide the motive force to move the accessor side to side (on the X-axis) and up and down (on the Y-axis). The controller part of this assembly is referred to as the XY controller.

Pivot assembly
A group of parts that provides a mounting platform for the gripper mechanism and the bar code reader. This assembly is capable of 180° rotation about the vertical axis.

Cartridge gripper
An electromechanical device (mounted on the pivot assembly) that gets or puts cartridges from or to a storage slot, tape drive, or I/O station. The gripper is independently controlled and can grip a single cartridge. There are two grippers on the pivot assembly (Gripper 1 and Gripper 2). The grippers are located in the dual-gripper transport mechanism (**3** in Figure 58 on page 257).

In libraries that use mixed drive types, the upper gripper supports LTO media and the lower gripper supports DLT media.

Bar code reader
A component that reads the bar code on a label that is affixed to a cartridge or to the rear of empty storage slots. The bar code reader is mounted on the pivot assembly. It is used during inventories, audits, insertions, and inventory updates (a process that is invoked each time you open a door; the inventory update determines whether cartridges have been added to or removed from the library, or moved within the library).

Calibration sensor
A component that provides a means to locate certain positions within the library very precisely during the calibration operation. The calibration sensor is mounted on the underside of Gripper 1. All positions are calculated from these locating positions.

Accessor Controller

The accessor controller (4 in Figure 58 on page 257) is the controller (circuit board) for the cartridge accessor. The accessor controller handles accessor motion requests, including calibrations, moves, and inventory updates. It also provides centralized management for other aspects of the entire library, including configuration, insert and eject operations, automatic drive cleaning, and determination of element status (for example, whether an element (such as a tape drive) is empty or occupied and the VOLSER of the tape that occupies it).

The Controller Area Network (CAN) provides communication between the XY controller, accessor controller, Medium Changer card packs, and operator panel controller. The Medium Changer card pack uses the drives' RS-422 interfaces to communicate between the accessor controller and all drives within any one frame.

Operator Panel Controller

The operator panel controller (see 5 in Figure 58 on page 257) facilitates communication between the accessor controller and the operator panel. It provides input to and output from the LCD, and senses and locks the I/O stations. In addition, the LCD activity and service menus are executed in the operator panel controller, with support from the accessor controller and the drives (via the Medium Changer card packs).

The operator panel connects to the accessor controllers, all Medium Changer card packs, and the XY controller through the Controller Area Network (CAN).

Frame Control Assembly

Located at the right rear of the UltraScalable Tape Library, the frame control assembly (FCA) (see 6 in Figure 58 on page 257) is a canister that contains:

7	Medium Changer card pack (MCP)	10	ac outlets
8	Power supplies	11	Circuit breakers
9	Frame control box (FCB)	12	Incoming main ac power

The FCB houses a receptacle for the incoming main ac power, three circuit breakers, and ten ac outlets for powering the tape drives (one outlet is required for every two drives).

Medium Changer Card Pack

The built-in multiplicity of library control paths via the UltraScalable Tape Library's RS-422 interface gives the library the ability to support multiple logical libraries (or Medium Changers, in SCSI terms). Because of this, controllers that are attached via the RS-422 interface are referred to as Medium Changer card packs (MCPs) (see **7** in Figure 58 on page 257).

For each cartridge storage frame that contains at least one drive or control port, there is one MCP logic card. The electronics of the card pack are located in the frame control box within the frame control assembly (see **9** in Figure 58 on page 257).

The MCP provides a communication path to each tape drive (via the RS-422 interface) or control port so that library commands can be funneled from the tape drives to the accessor. It includes one RS-422 interface allotted for each drive or control port in the frame, and two Controller Area Network (CAN) ports (one for each CAN bus that can be installed in the library). It also provides management and service interfaces to outside hosts.

The MCP on the Model L32 also includes a port for 10/100 Mbs Ethernet support. MCPs with this capability are characterized by a design that is different from earlier MCP cards. Figure 59 shows an MCP with a 10/100 Mbs Ethernet port.

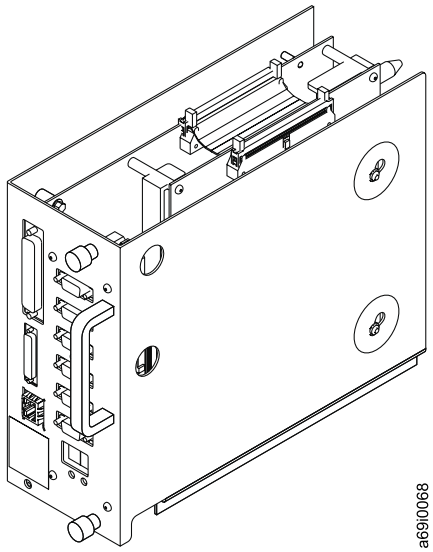

Figure 59. MCP with 10/100 Ethernet port

Drive and Power Supply Compartment

The UltraScalable Tape Library is designed so that each Ultrium Tape Drive, DLT 8000 Tape System, and control port is paired with an associated power supply. Each pairing is packaged side by side on a shelf in a frame. In addition, adjacent power supplies are cabled together. The pairing is such that redundant power becomes a standard function, provided that the drives and power supplies are on shelves, not trays. The design offers the following advantages:

- Allows you to remove or replace a tape drive or control port without breaking the SCSI bus connection between the library and the host
- Enables a tape drive with a failed power supply to continue operating by using power from an adjacent power supply (also known as redundant drive power)

Figure 60 shows the rear of the UltraScalable Tape Library and the compartment that contains the tape drives, control ports, and power supplies.

1	Control port canister	6	Redundant drive ac power cable
2	Drive canister	7	Redundant drive dc power cable (for top slot)
3	Fibre Channel cable connection	8	Drive power supply
4	VHDCI SCSI terminator	9	Fixed sled assembly
5	SCSI cables		

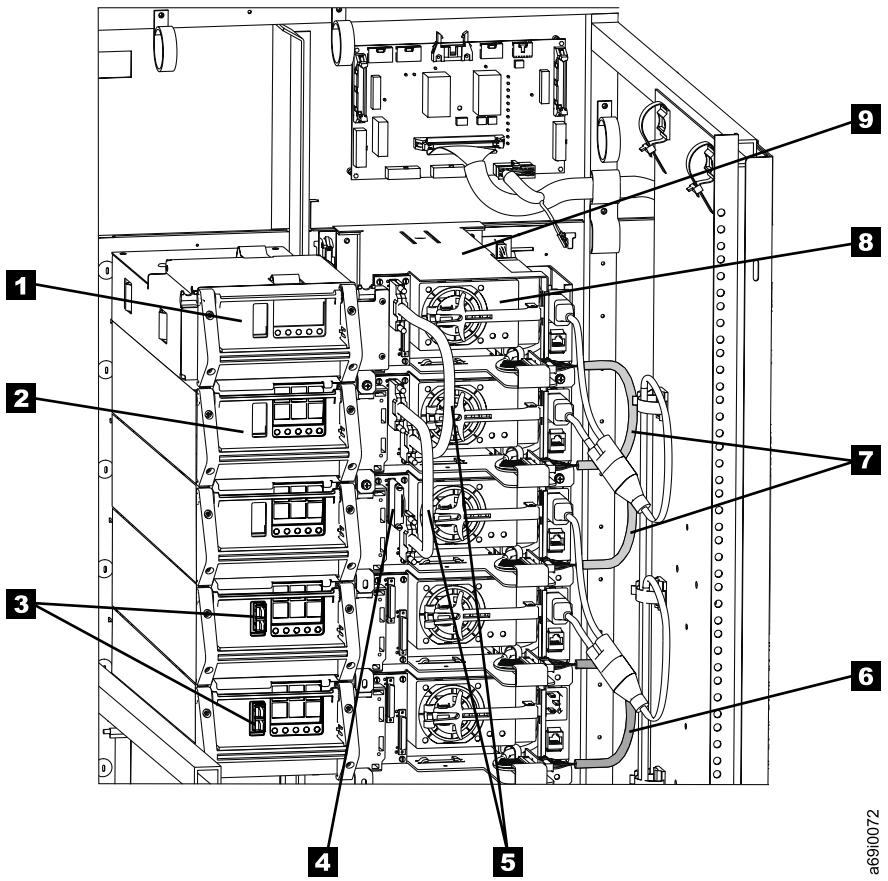

Figure 60. Compartment that houses the tape drives, control ports, and the power supplies. The view is from the rear of the UltraScalable Tape Library. The left side of the library has been removed.

A frame contains 13 shelves. In frames that contain DLT 8000 Tape Systems, the top shelf can only contain a control port. For frames that contain Ultrium Tape Drives, the top shelf is unused. Each drive or control port is housed in a removable canister, and each power supply is housed on a fixed sled. Both fit side by side on a shelf within the compartment and are identified by the following labels:

CP	Control port
D8	DLT 8000 Tape System
L1	IBM Ultrium 1 Tape Drive
L2	IBM TotalStorage LTO Ultrium 2 Tape Drive
FC-AL	Fibre Channel Arbitrated Loop
FC-1Gb/sec	Fibre Channel - 1 Gigabit per second
FC-2Gb/sec	Fibre Channel - 2 Gigabit per second
HVD	High voltage differential
LVD	Low voltage differential

The library uses VHDCI SCSI connectors that connect to ports which are mounted between the power supplies and the drives or control ports. The earlier version of the SCSI drive uses HD68 connectors. The HD68 drive is packaged on a tray (sled) and is still orderable for a limited time. For more information, see Appendix E, “Feature Codes”, on page 283.

You can remove or replace any drive or control port without disconnecting its SCSI cable. When removing and replacing a drive or control port, use the following guidelines:

- **Ultrium Tape Drive with Fibre Channel Interface:** Quiesce the drive (both LUN 0 and LUN 1) before removing it. Disconnect the Fibre Channel cable and remove or replace the drive. Reconnect the Fibre Channel cable to the new drive. After removing and replacing the drive, you do not need to perform an initial program load (IPL) on the host. The World Wide Node Name, World Wide Port Name, Loop ID, and AL_PA remain the same, and no other device is affected.
- **Ultrium Tape Drive with SCSI Interface:** Quiesce the drive (both LUN 0 and LUN 1) and any other devices on the same SCSI bus before removing the drive. After removing and replacing the drive, you do not need to perform an initial program load (IPL) on the host. The SCSI ID remains the same, and no other device is affected.
- **DLT 8000 Tape System:** Quiesce the drive (both LUN 0 and LUN 1) and any other devices on the same SCSI bus before removing the drive. After removing and replacing the drive, you do not need to perform an initial program load (IPL) on the host. The SCSI ID remains the same, and no other device is affected.
- **Control port:** Quiesce the control port (LUN 0) and any other devices on the same SCSI bus before removing the control port. After removing and replacing the control port, you do not need to perform an initial program load (IPL) on the host. The SCSI ID remains the same, and no other device is affected.

If a power supply fails, an adjacent power supply will provide power. Table 36 shows the position of the power supplies that are cabled together to supply redundant power. Positions range from the top of the compartment to the bottom, with position 0 as the top shelf and position 12 as the bottom shelf.

Table 36. Positions of redundant power supplies. The cabling of the redundant power supplies differs for DLT 8000 Tape Systems and Ultrium Tape Drives.

Positions of Redundant Power Supplies in Drive and Power Supply Compartment	
DLT 8000 Tape Systems	**Ultrium Tape Drives**
0, 1, 2	1, 2
3, 4	3, 4
5, 6	5, 6
7, 8	7, 8
9, 10	9, 10
11, 12	11, 12

Dual ac Power

IBM provides two line cords of the default or specified line cords (either 110 V ac or 220 V ac) when feature code #1901 is ordered.

By default, all power is drawn from the main power feed (see **1** in Figure 61). The dual ac power feature provides a second line cord for connection to two independent branch power feeds. The line cords connect to a power switch **3** that monitors the ac line voltage on the primary power feed. If the incoming voltage is lost, the power switch automatically draws power from the backup power feed **2**. When power is restored to the main power feed, the switch automatically returns the power back to the main power feed. Figure 61 shows the dual ac power feature.

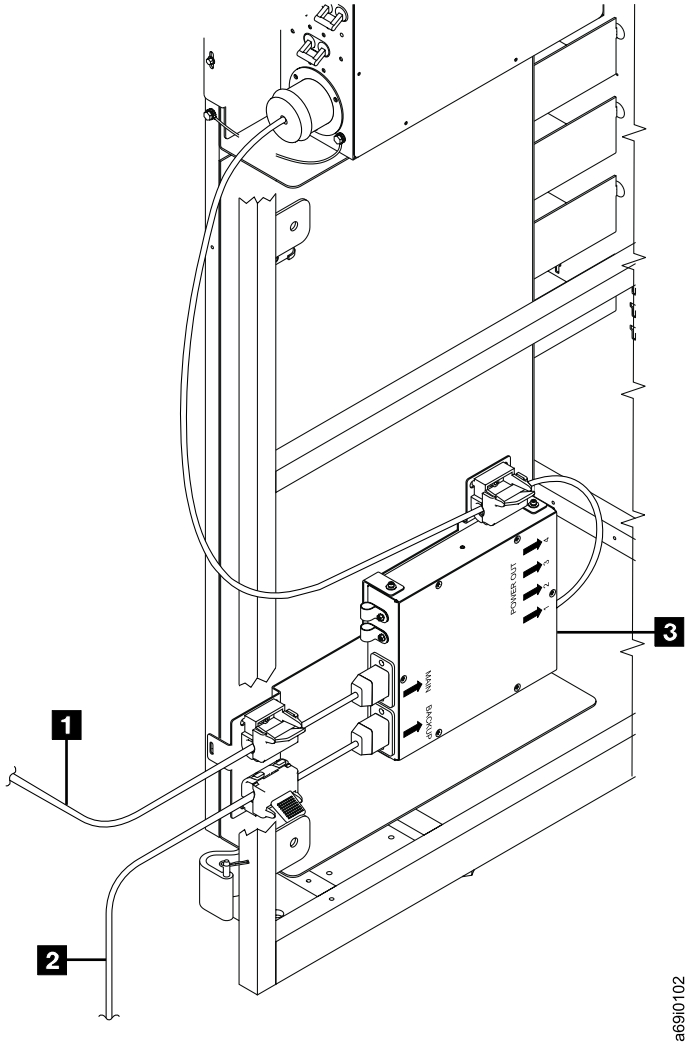

Figure 61. Dual ac power. The view is from the side and rear of a frame. The side panel has been removed to show the placement of the dual ac power.

Appendix C. TapeAlert Flags

TapeAlert is a standard that defines status conditions and problems experienced by devices such as tape drives, autoloaders, and libraries. The standard enables a server to read TapeAlert messages (called *flags*) from a tape drive via the SCSI bus. The server reads the flags from Log Sense Page 0x2E.

The IBM TotalStorage UltraScalable Tape Library 3584 is compatible with TapeAlert technology, which provides error and diagnostic information about the drives and the library to the server.

TapeAlert flags that are supported by the Ultrium Tape Drives and the UltraScalable Tape Library generate SNMP traps; those that are supported by the DLT 8000 Tape System do not.

This appendix lists TapeAlert flags that are supported by the Ultrium Tape Drives, the DLT 8000 Tape System, and the UltraScalable Tape Library.

TapeAlert Flags Supported by the Ultrium Tape Drives

TapeAlert Flags Supported by the Ultrium Tape Drives			
Flag Number	**Flag**	**Description**	**Action Required**
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
4	Media	Set for any unrecoverable read, write, or positioning error that is due to a faulty tape cartridge.	Replace the tape cartridge.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see “Setting the Write-Protect Switch” on page 202). If Flag Number 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
8	Not data grade	Set when the cartridge is not data-grade. Any data that you write to the tape is at risk.	Replace the tape with a data-grade tape.

TapeAlert Flags Supported by the Ultrium Tape Drives			
Flag Number	**Flag**	**Description**	**Action Required**
9	Write protect	Set when the tape drive detects that the tape cartridge is write-protected.	Make sure that the cartridge's write-protect switch is set so that the tape drive can write data to the tape (see "Setting the Write-Protect Switch" on page 202).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server's operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.
14	Unrecoverable snapped tape	Set when the tape split apart.	Do not attempt to extract the old tape cartridge. Call the tape drive supplier's help line.
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the tape cartridge. If this error occurs on multiple cartridges, see Error Code 6 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read all data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive (see "Drive Cleaning" on page 24).
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon. See "Drive Cleaning" on page 24.
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs that requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide* for the appropriate instructions.

TapeAlert Flags Supported by the Ultrium Tape Drives			
Flag Number	**Flag**	**Description**	**Action Required**
31	Hardware B	Set when the tape drive fails its internal Power-On Self Tests.	Note the error code on the single-character display and see the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide* for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI, Fibre Channel, or RS-422 interface.	Locate Error Code 8 or 9 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive.	Unload the tape cartridge, then reinsert it and restart the operation.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive through the SCSI or Fibre Channel interface.	Ensure that it is the correct FMR image. Download the FMR image again.
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the library.	See Error Code 1 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are either approaching the specified voltage limits or are outside the voltage limits (see "Power and Cooling Specifications" on page 40).	See Error Code 2 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	See Error Code 6 located in the list of drive error codes in the *IBM TotalStorage UltraScalable Tape Library 3584 Maintenance Information guide*.
51	Tape directory invalid at unload	Set when the tape directory on the tape cartridge that was previously unloaded is corrupted. The file-search performance is degraded.	Use your backup software to rebuild the tape directory by reading all the data.
52	Tape system area write failure	Set when the tape cartridge that was previously unloaded could not write its system area successfully.	Copy the data to another tape cartridge, then discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at load time.	Copy the data to another tape cartridge, then discard the old cartridge.

TapeAlert Flags Supported by the DLT 8000 Tape System

TapeAlert Flags Supported by the DLT 8000 Tape System			
Flag Number	**Flag**	**Description**	**Action Required**
1	Read warning	Set when the tape drive has severe problems reading data from the tape. No data has been lost, but performance is reduced.	Perform one of the following: • If this flag occurs for multiple tape cartridges, contact your IBM Service Representative to replace the tape drive. • If this flag occurs for only one tape cartridge, the cartridge is defective. Copy any data from the tape and discard it.
2	Write warning	Set when the tape drive has severe problems writing data to the tape. No data has been lost.	Try the operation on a different tape cartridge: • If this flag occurs for multiple tape cartridges, contact your IBM Service Representative to replace the tape drive. • If this flag occurs for only one tape cartridge, the cartridge is defective. Copy any data from the tape and discard it.
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 4 is also set, retry the job using a different tape cartridge. If the retry was successful, the original tape cartridge is defective. Copy any data from the tape and discard it. If the retry was not successful, contact your IBM Service Representative to replace the tape drive. If Flag Number 4 is not also set, the problem could be caused by drive firmware or by a drive hardware failure. Contact your IBM Service Representative.

TapeAlert Flags Supported by the DLT 8000 Tape System			
Flag Number	**Flag**	**Description**	**Action Required**
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape. Make sure that the write-protect switch is set so that data can be written to the tape. If Flag Number 4 is also set, retry the job using a different tape cartridge. If the retry was successful, the original tape cartridge is defective. Copy any data from the tape and discard it. If the retry was not successful, contact your IBM Service Representative to replace the tape drive. If Flag Number 4 is not also set, the problem could be caused by drive firmware or by a drive hardware failure. Contact your IBM Service Representative.
9	Write protect	Set when the tape drive detects that the tape cartridge is write protected.	Make sure that the cartridge's write-protect switch is set so that the tape drive can write data to the tape (see "Setting the Write-Protect Switch" on page 202).
10	No removal	Set when the tape drive receives an unload command after the host prevented the tape cartridge from being removed.	Refer to the documentation for your host operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive.
22	Expired cleaning media	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
31	Hardware B	Set when the tape drive fails its internal Power-On Self Test (POST).	Retry the job using a different tape cartridge. If the retry was successful, the original tape cartridge is defective. Copy any data from the tape and discard it. If the retry was not successful, contact your IBM Service Representative to replace the tape drive.
32	Interface	Set when the tape drive detects a problem with the SCSI or RS-422 interface.	Contact your IBM Service Representative.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive via the SCSI interface.	Download the FMR image again (ensure that it is the correct image).

TapeAlert Flags Supported by the Library

TapeAlert Flags Supported by the UltraScalable Tape Library			
Flag Number	**Flag**	**Description**	**Action Required**
1	Library hardware A	The library has trouble communicating with the drive.	1. Restart the operation. 2. If the problem persists, call your IBM Service Representative.
2	Library hardware B	The library has a hardware failure.	1. Restart the operation. 2. If the problem persists, call your IBM Service Representative.
4	Library hardware D	The library has a hardware fault that is not mechanically related.	1. Restart the operation. 2. If the problem persists, call your IBM Service Representative.
11	Library voltage limits	A potential failure of a power supply exists.	Call your IBM Service Representative.
16	Library door	A library door is open and prevents the library from functioning.	1. Close the library door. 2. If the problem persists, call your IBM Service Representative.
17	Library I/O station	A problem with an I/O station exists.	1. Ensure that there is no obstruction in the I/O station. 2. Restart the operation. 3. If the problem persists, call your IBM Service Representative.
23	Library scan retry	The operation to scan the bar code on a cartridge had to perform an excessive number of retries before succeeding. A potential problem exists with the bar code label or the scanner hardware in the library mechanism.	1. Check for damaged, misaligned, or peeling bar code labels on cartridges. 2. If the problem persists, call your IBM Service Representative.
24	Library inventory	An inventory of the media was inconsistent.	1. Run a library inventory to correct the inconsistency. 2. Restart the operation. 3. If the problem persists, call your IBM Service Representative.
25	Library illegal operation	The library detected an illegal operation.	If the problem persists, call your IBM Service Representative.
28	Power supply	A redundant power supply failure exists inside the library.	Call your IBM Service Representative.
32	Unreadable bar code label	During an inventory or scan, the library was unable to read a bar code label on a cartridge.	1. Check for damaged, misaligned, or peeling bar code labels on the cartridge. 2. If no problem is found, call your IBM Service Representative.

Appendix D. Locations and Addresses of SCSI Elements

In the IBM TotalStorage UltraScalable Tape Library 3584, each storage slot, I/O slot, and drive is assigned a logical SCSI element address by the library's firmware. When moving a tape cartridge within the library, you can specify its source and destination by SCSI element address (although many operators prefer to specify a VOLSER, or a frame, column, and row address).

For the following frames, this appendix shows the physical locations of storage slots and drives, and provides the rules for determining their SCSI element addresses (as well as the element addresses of the I/O slots).

- Model L32 (base frame) without the Capacity Expansion Feature
- Model L32 (base frame) with the Capacity Expansion Feature
- Model D32 (expansion frame)
- Model D42 (expansion frame)

Note: Element addresses vary, depending on the quantity of storage slots in the library. In turn, the quantity of storage slots depends on the quantity of drives in the library, whether the Capacity Expansion Feature is installed, and whether the Expanded I/O Station is included. As an aid in determining element addresses for each of the above frames, this appendix also includes tables that list the quantity of available storage slots, based on the preceding factors.

Location and Quantity of Addressable Storage Elements in Model L32 without Capacity Expansion Feature

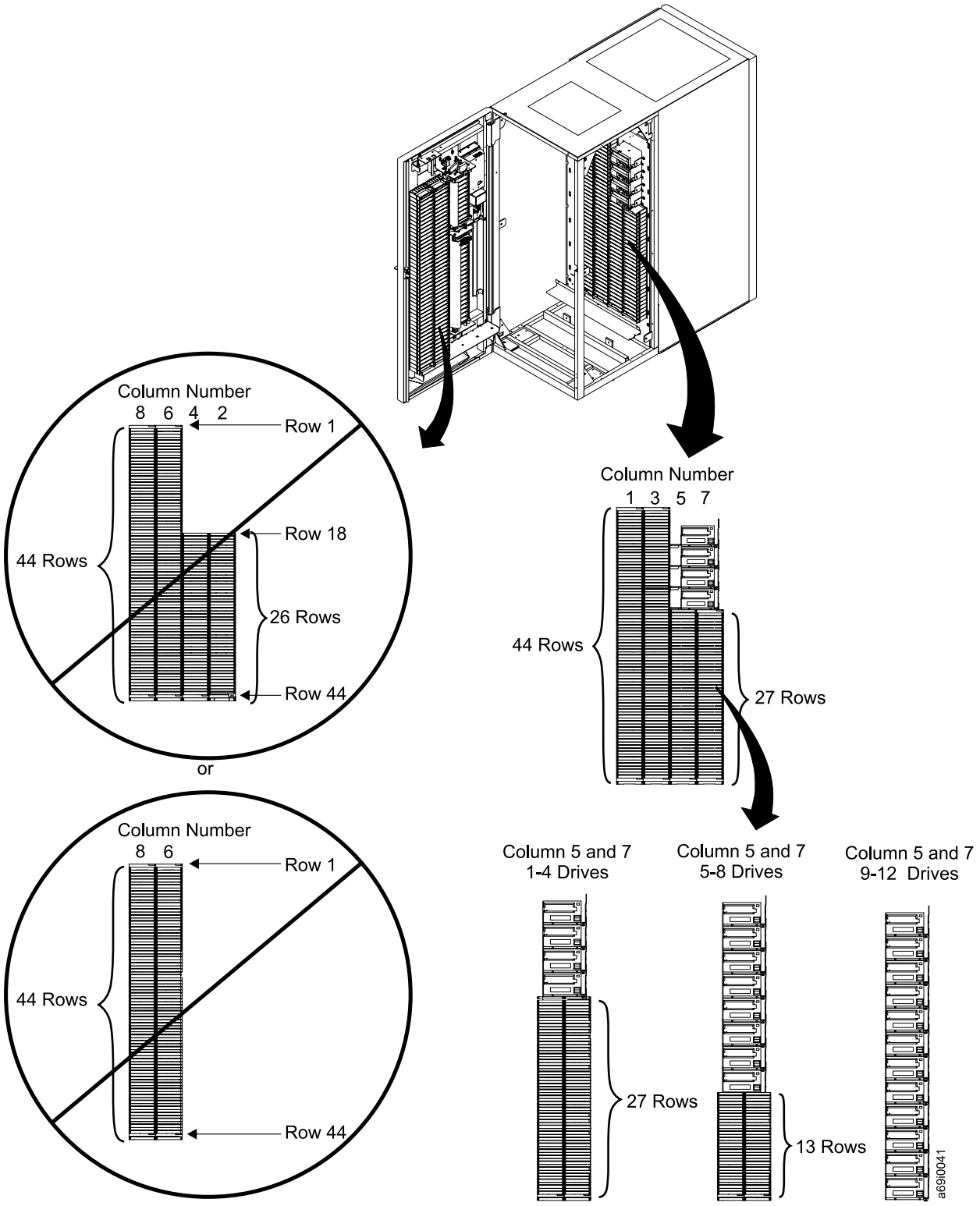

Figure 62. Location of storage elements in Model L32 without the capacity expansion feature. The storage slots on the door are unavailable.

Table 37. Quantity of SCSI-addressable storage slots (per column) in Model L32 frame without capacity expansion feature

Column Number	Quantity of Storage Slots in Model L32 Frame without Capacity Expansion Feature		
	1-4 Drives	**5-8 Drives**	**9-12 Drives**
1	43	43	43
2	0	0	0
3	44	44	44
4	0	0	0
5	27	13	0
6	0	0	0
7	27	13	0
8	0	0	0
Total	141	113	87
Note: Column 1, Row 1 of the Model L32 is reserved for a diagnostic cartridge.			

Location and Quantity of Addressable Storage Elements in Model L32 with Capacity Expansion Feature

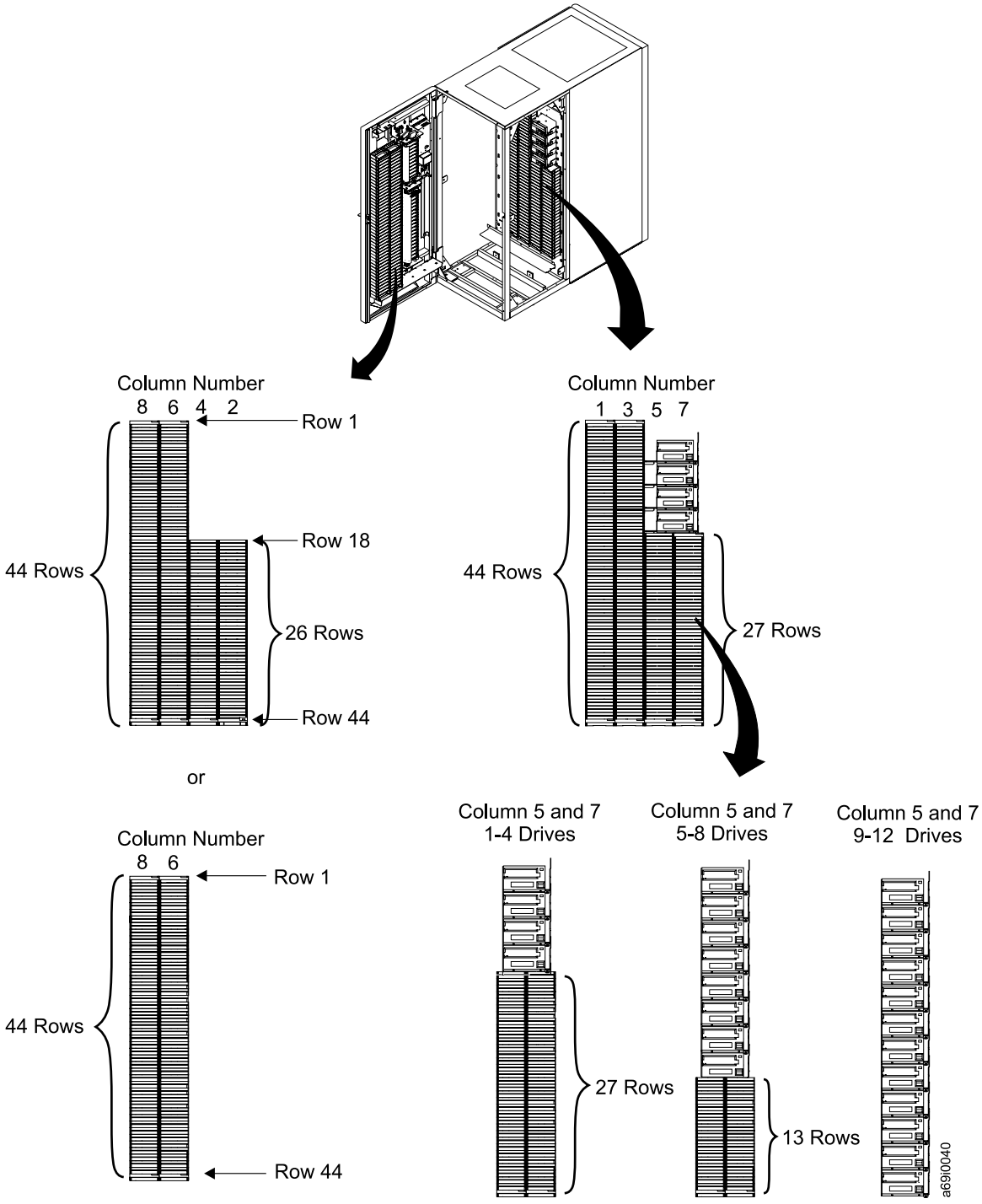

Figure 63. Location of storage elements in Model L32 with the capacity expansion feature. The storage slots on the door are available.

Table 38. Quantity of SCSI-addressable storage slots (per column) in Model L32 frame with capacity expansion feature and 10 I/O slots

Column Number	Quantity of Storage Slots in Model L32 Frame with Capacity Expansion Feature and 10 I/O Slots		
	1-4 Drives	5-8 Drives	9-12 Drives
1	43	43	43
2	26	26	26
3	44	44	44
4	26	26	26
5	27	13	0
6	44	44	44
7	27	13	0
8	44	44	44
Total	281	253	227
Note: Column 1, Row 1 of the Model L32 is reserved for a diagnostic cartridge.			

Table 39. Quantity of SCSI-addressable storage slots (per column) in Model L32 frame with capacity expansion feature and 28 or 30 I/O slots

Column Number	Quantity of Storage Slots in Model L32 Frame with Capacity Expansion Feature and 28 or 30 I/O Slots		
	1-4 Drives	5-8 Drives	9-12 Drives
1	43	43	43
2	0	0	0
3	44	44	44
4	0	0	0
5	27	13	0
6	44	44	44
7	27	13	0
8	44	44	44
Total	229	201	175
Note: Column 1, Row 1 of the Model L32 is reserved for a diagnostic cartridge.			

Location and Quantity of Addressable Storage Elements in Model D32

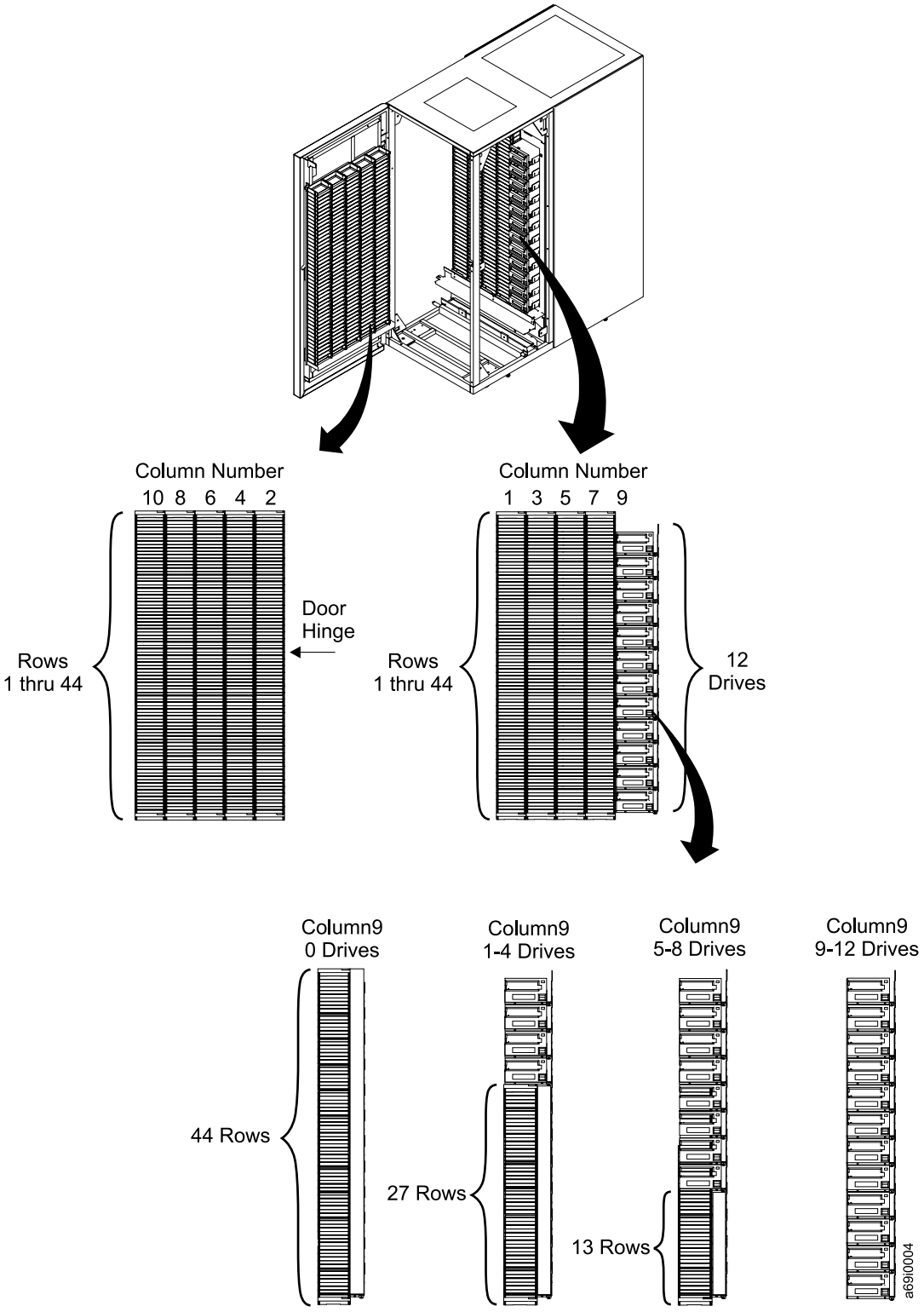

Figure 64. Location of storage elements in Model D32

Table 40. Quantity of SCSI-addressable storage slots (per column) in Model D32 frame

Column Number	Quantity of Storage Slots per Drives in Model D32 Frame			
	0 Drives	**1-4 Drives**	**5-8 Drives**	**9-12 Drives**
1	44	44	44	44
2	44	44	44	44
3	44	44	44	44
4	44	44	44	44
5	44	44	44	44
6	44	44	44	44
7	44	44	44	44
8	44	44	44	44
9	44	27	13	0
10	44	44	44	44
Total	440	423	409	396

Location of Storage Elements in Model D42

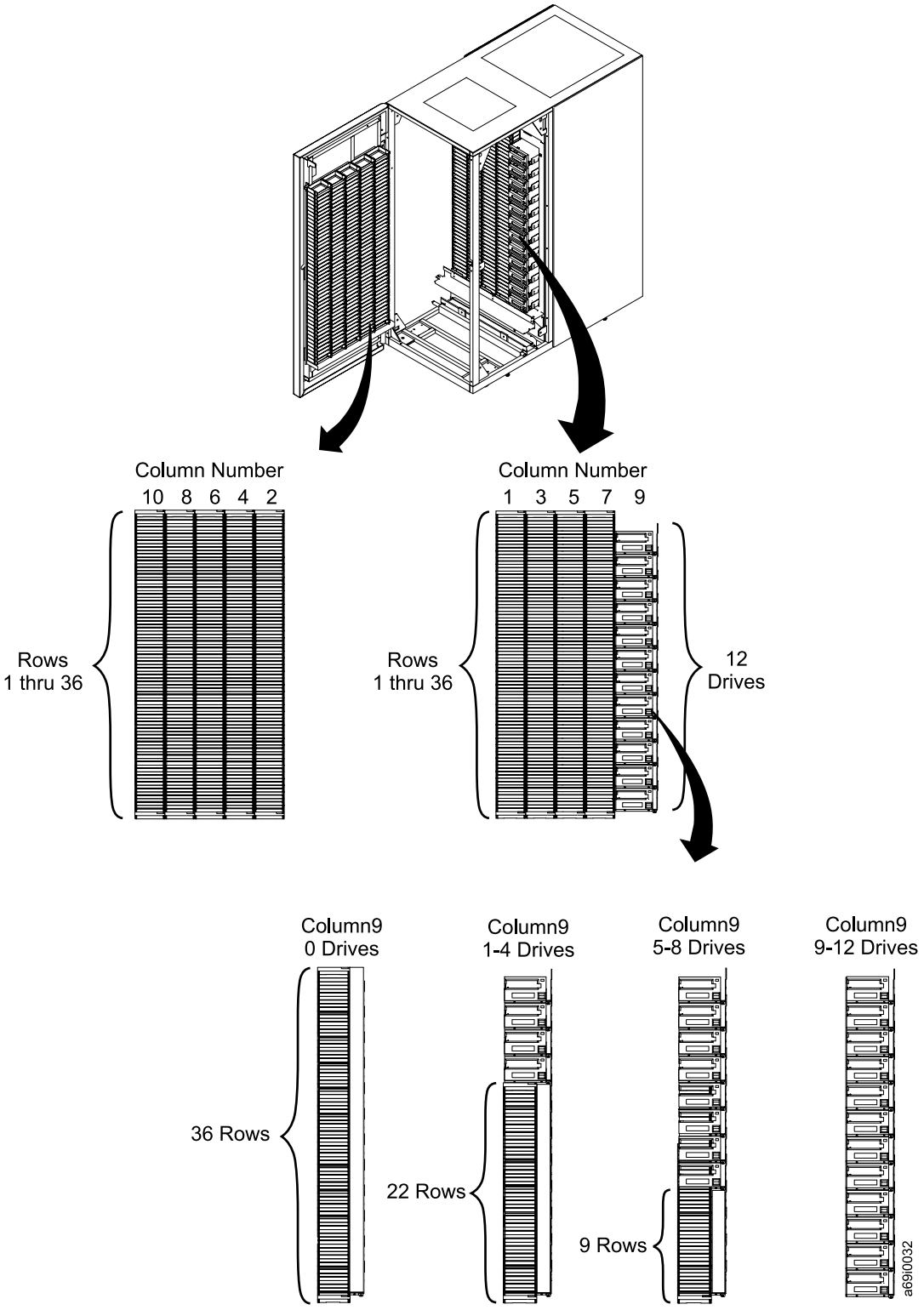

Figure 65. Storage elements in Model D42

Table 41. Quantity of SCSI-addressable storage slots (per column) in Model D42 frame

Column Number	Quantity of Storage Slots per Drives in Model D42 Frame			
	0 Drives	**1-4 Drives**	**5-8 Drives**	**9-12 Drives**
1 (see Note)	36	36	36	36
2	36	36	36	36
3	36	36	36	36
4	36	36	36	36
5	36	36	36	36
6	36	36	36	36
7	36	36	36	36
8	36	36	36	36
9	36	22	9	0
10	36	36	36	36
Total (see Note)	360	346	333	324

Note: For the first DLT frame in the library, Column 1, Rows 1 and 2 are reserved for diagnostic cartridges. In this case, the quantity of slots in Column 1 (and the totals) reduces by 2.

Determining SCSI Element Addresses

Apply the following rules when determining the SCSI element addresses of storage elements (storage slots), import/export elements (I/O slots), and data transfer elements (drives).

Storage Element Addresses for Storage Slots

The library assigns storage element (StE) addresses sequentially to all storage slots in each frame, regardless of media type. It uses the following scheme for addressing:

1. Begin with the Model L32 frame and assign the addresses from top to bottom, starting at Column 1, Row 1 with address 1024 (X'400').

   Note: Column 1, Row 1 of the first LTO frame is reserved for a diagnostic cartridge and is not addressable by the host application. Column 1, Rows 1 and 2 of the first DLT frame are reserved for diagnostic cartridges and are not addressable by the host application.
2. Move to Column 2 and continue the sequence from top to bottom, ignoring the I/O stations.
3. Continue to assign addresses in this manner (ignoring the I/O stations and drives) until each storage slot in the frame has been assigned a SCSI StE address.
4. If the library contains more than one frame, move right to the next frame and repeat this step (continuing with the next number in the sequence).

Figure 66 on page 281 shows one example of how the library assigns the SCSI storage element addresses.

Import/Export Element Addresses for I/O Slots

The library assigns import/export element (IEE) addresses sequentially to all I/O slots, from top to bottom, and regardless of media type, beginning at I/O slot 1 of the Model L32, with address 769 (X'301').

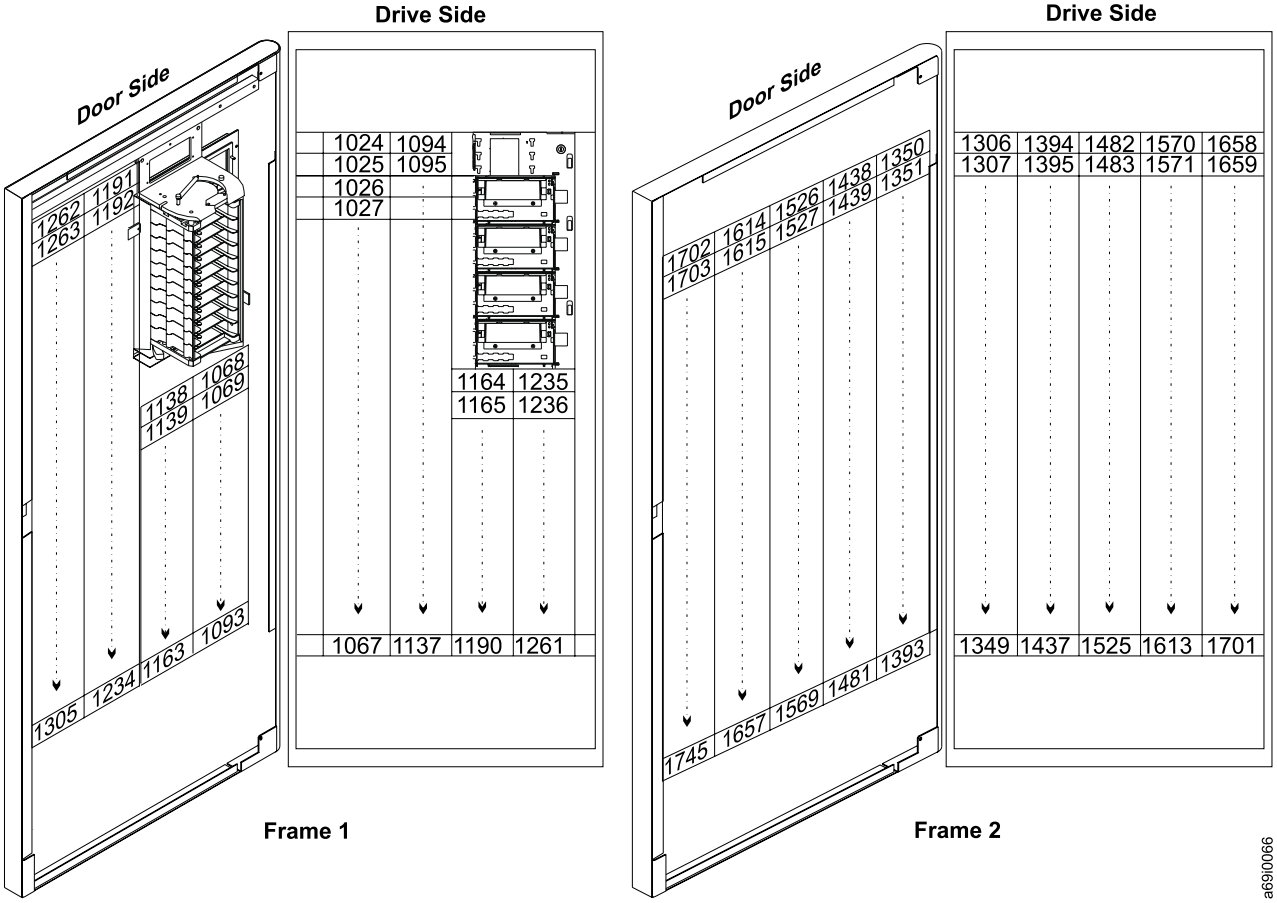

Figure 66. Assigning SCSI StE addresses to storage slots. The example shows two LTO frames, each with their front doors open. When assigning StE addresses, the library ignores the I/O stations and drives, and assigns the addresses to the slots beneath them.

Data Transfer Element Addresses for Drives

The library assigns data transfer element (DTE) addresses sequentially to all 12 possible drive positions in each frame, regardless of media type. It uses the following scheme for addressing:

1. Begin with the Model L32 frame and assign the addresses from top to bottom.
2. If the library contains more than one frame, move right to the next frame and continue the sequence from top to bottom.
3. Continue to assign addresses in this manner until each drive in every frame has been assigned a SCSI DTE address

Table 42 lists the SCSI addresses for the DTEs.

Table 42. Range of SCSI Data Transfer Element (DTE) addresses for tape drives in frames 1 through 16

Frame	Range of SCSI DTE Addresses for Tape Drives	
	Row 1	Row 12
1	257(X'101')	268(X'10C')
2	269(X'10D')	280(X'118')
3	281(X'119')	292(X'124')
4	293(X'125')	304(X'130')
5	305(X'131')	316(X'13C')
6	317(X'13D')	328(X'148')
7	329(X'149')	340(X'154')
8	341(X'155')	352(X'160')
9	353(X'161')	364(X'16C')
10	365(X'16D')	376(X'178')
11	377(X'179')	388(X'184')
12	389(X'185')	400(X'190')
13	401(X'191')	412(X'19C')
14	413(X'19D')	424(X'1A8')
15	425(X'1A9')	436(X'1B4')
16	437(X'1B5')	448(X'1C0')
Note: Addresses are given in decimal and hexadecimal format.		

Appendix E. Feature Codes

When ordering the IBM TotalStorage UltraScalable Tape Library 3584, you can use feature codes to perform the following actions:

- Specify plant or field installation of tape drives
- Specify host configurations
- Identify the specific attachment type
- Order open systems device drivers

Depending on the model, different features are available for the UltraScalable Tape Library:

- Table 43 lists the feature codes for Model L32
- Table 44 lists the feature codes for Model D32
- Table 45 lists the feature codes for Model D42

Feature Codes for Model L32 (Base Frame)

Table 43. Feature codes for Model L32 of the IBM TotalStorage UltraScalable Tape Library 3584

Feature Code	Description
1454	LTO Ultrium Low Voltage Differential (LVD) drive canister (see Note 1)
1455	LTO Ultrium High Voltage Differential (HVD/DIFF) drive canister (see Note 1)
1456	LTO Ultrium Fibre Channel-Arbitrated Loop (FC-AL) drive canister (see Note 2)
1462	Fibre Channel patch panel
1464	LTO Ultrium LVD drive on tray (see Note 4)
1465	LTO Ultrium HVD drive on tray (see Note 4)
1466	LTO Ultrium FC-AL drive on tray (see Note 4)
1474	LTO Ultrium 2 LVD drive canister (see Note 8)
1475	LTO Ultrium 2 HVD drive canister (see Note 8)
1476	LTO Ultrium 2 Fibre drive canister (see Note 9)
1603	Capacity expansion (see Note 3)
1607	Mixed drive types/Model D42 support (see Note 4)
1653	Capacity expansion (plant installation) (see Note 4)
1657	20 additional LTO I/O slots
1660	10/100 Ethernet support (field only; see Note 5)
1662	UltraScalable Specialist support (also known as 3584 Specialist) (see Note 6)
1663	Drive removal
1664	Patch panel removal (see Note 4)
1665	LTO Ultrium drive reinstall (see Notes 6 and 7)
1666	Drive install, 1663/1455 (see Note 4)
1667	Drive install, 1663/1456 (see Note 4)

Table 43. Feature codes for Model L32 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description
1670	Drive install, 1664/1462 (see Note 4)
1671	Drive install, 1663/1464 (see Note 4)
1672	Drive install, 1663/1465 (see Note 4)
1673	Drive install, 1663/1466 (see Note 4)
1680	Control Path Failover
1802	1 to 2-frame X-track cable (see Note 11)
1806	3 to 6-frame X-track cable (see Notes 12 and 13)
1814	7 to 14-frame X-track cable (see Notes 14, 15, and 16)
1816	8 to 16-frame X-track cable (see Notes 15, 17)
1901	Dual ac power feature
2710	Remote Support Facility
2711	Remote Support switch
2712	Remote Support attachment
2895	Interposer, IBM iSeries or AS/400 server, feature 6501
5096	Interposer SC-LC Fibre
5098	Inline HVD SCSI terminator
5099	VHDCI/HD68 cable/interposer
5305	HD68-to-HD68 SCSI cable, 5 m (17 ft)
5310	HD68-to-HD68 SCSI cable, 10 m (33 ft)
5318	HD68-to-HD68 SCSI cable, 18 m (59 ft)
5325	HD68-to-HD68 SCSI cable, 25 m (82 ft)
5604	VHDCI-to-HD68 SCSI cable, 4.5 m (14 ft)
5610	VHDCI-to-HD68 SCSI cable, 10 m (33 ft)
5620	VHDCI-to-HD68 SCSI cable, 20 m
5625	VHDCI-to-HD68 SCSI cable, 25 m (82 ft)
5704	VHDCI-to-VHDCI SCSI cable, 4.5 m (14 ft)
5710	VHDCI-to-VHDCI SCSI cable, 10 m (33 ft)
5720	VHDCI-to-VHDCI SCSI cable, 20 m (65 ft)
5725	VHDCI-to-VHDCI SCSI cable, 25 m (82 ft)
5805	SC-SC Fibre Channel cable, 5 m (17 ft)
5813	SC-SC Fibre Channel cable, 13 m (43 ft)
5825	SC-SC Fibre Channel cable, 25 m (82 ft)
5861	SC-SC Fibre Channel cable, 61 m (200 ft)
5907	LC-SC Fibre Channel cable, 7 m (23 ft)
5913	LC-SC Fibre Channel cable, 13 m (43 ft)
5922	LC-SC Fibre Channel cable, 22 m (72 ft)
5961	LC-SC Fibre Channel cable, 61 m (200 ft)
6005	LC-LC Fibre Channel cable, 5 m (17 ft)
6013	LC-LC Fibre Channel cable, 13 m (43 ft)

Table 43. Feature codes for Model L32 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description
6025	LC-LC Fibre Channel cable, 25 m (82 ft)
6061	LC-LC Fibre Channel cable, 61 m (200 ft)
8750	IBM LTO Ultrium Cleaning Cartridge
8757	IBM LTO Ultrium Data Cartridge, 20-pack, unlabeled
8767	IBM TotalStorage LTO Ultrium 200 GB Data Cartridge, 20-pack
9002	First expansion frame attachment (see Note 10)
9003	Additional expansion frame attachment (see Note 10)
9210	Attached to HP-UX system
9211	Attached to Sun system
9212	Attached to Windows system
9213	Attached to other non-IBM system
9215	Attached to Linux system
9316	8 to 16-frame X-track cable (see Note 18)
9400	Attached to IBM iSeries or AS/400 server
9600	Attached to IBM pSeries or RS/6000 server
9660	10/100 Ethernet support (mandatory and plant only; see Note 5)
9700	No host cables from plant
9724	Power cord, EMEA, hard wired
9951	Power cord, 110 V ac, 4.3 m (14 ft), twistlock non-watertight connector plug type L5-20P
9986	Power cord, 250 V ac, 1.8 m (6 ft), twistlock, watertight connector, Chicago (available only in the U. S. and only at time of order)
9987	Power cord, 250 V ac 30 A, 4.3 m (14 ft), twistlock, non-watertight connector type L6-30P (available only in the U. S. and Canada, and available only at time of order)
9988	Power cord, 250 V ac 30A, 4.3 m (14 ft), twistlock, watertight connector (available only in the U. S., Canada, Japan, Korea, Philippines, and Taiwan)

Table 43. Feature codes for Model L32 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description

Notes:

1. Drive features 1454 and 1455 shipped prior to August 31, 2001 have HD68 SCSI connectors. Drive features 1454 and 1455 shipped on or after August 31, 2001 use VHDCI SCSI connectors.
2. Drive feature 1456 is equipped with an SC connector.
3. This feature is not a new feature, but the description has changed. Also, this feature is now for both plant and field installation.
4. Withdrawn from marketing.
5. Remote 10/100 Ethernet support (feature code 9660) is required with all new orders.
6. This feature is not a new feature, but the description has changed.
7. Feature code 1665 provides installation of a customer-provided LTO Ultrium Drive (previously removed by feature code 1663) into an existing UltraScalable Tape Library.
8. Feature codes 1474 and 1475 come with VHDCI SCSI connectors.
9. Feature code 1476 comes with an LC connector.
10. One first frame attachment feature (9002) or one additional expansion frame attachment feature (9003) must be added to the Model L32 for each Model D32 expansion frame that is attached. This assures that proper cables are shipped and that the configurations records are correct.
11. Required when you have 3 to 16 frames and you want to remove frames such that 1 or 2 frames remain.
12. Required when you have 1 to 2 frames and you want to add frames for a total of 3 to 6 frames.
13. Required when you have 7 to 16 frames and you want to remove frames for a total of 3 to 6 frames.
14. Required when you have 1 to 6 frames and you want to add one frame for a total of 7 frames.
15. Required when you have 1 to 6 frames and you want to add frames for a total of 8 to 14 frames.
16. Required when you have 8 to 16 frames, when you have feature code 1816 or 9316 installed, and when you want to remove frames such that you have a total of 7 frames.
17. Required when you have 1 to 14 frames, when feature code 9316 is not installed, and when you want to add frames for a total of 15 to 16 frames.
18. Must be added to any IBM TotalStorage UltraScalable Tape Library 3584 that comes from the plant and has 15 to 16 frames (14 or 15 Model D32 expansion frames attached to the Model L32).

Feature Codes for Model D32 (Expansion Frame)

Table 44. Feature codes for Model D32 of the IBM TotalStorage UltraScalable Tape Library 3584

Feature Code	Description
1452	Frame control assembly
1454	LTO Ultrium Low Voltage Differential (LVD) drive canister (see Note 1)
1455	LTO Ultrium High Voltage Differential (HVD/DIFF) drive canister (see Note 1)
1456	LTO Ultrium Fibre Channel-Arbitrated Loop (FC-AL) drive canister (see Note 2)
1462	Fibre Channel patch panel
1464	LTO Ultrium LVD drive on tray (see Note 4)
1465	LTO Ultrium HVD drive on tray (see Note 4)
1466	LTO Ultrium FC-AL drive on tray (see Notes 2 and 4)
1474	LTO Ultrium 2 LVD drive canister (see Note 7)
1475	LTO Ultrium 2 HVD drive canister (see Note 7)
1476	LTO Ultrium 2 Fibre Channel drive canister (see Note 8)
1660	10/100 Ethernet support (see Note 3)
1663	Drive removal
1664	Patch panel removal (see Note 4)
1665	LTO Ultrium drive reinstall (see Notes 5 and 6)
1666	Drive install, 1663/1455 (see Note 4)
1667	Drive install, 1663/1456 (see Note 4)
1670	Drive install, 1664/1462 (see Note 4)
1671	Drive install, 1663/1464 (see Note 4)
1672	Drive install, 1663/1465 (see Note 4)
1673	Drive install, 1663/1466 (see Note 4)
1901	Dual ac power feature
1902	Additional 37 V dc power supply
2895	Interposer, IBM iSeries server or AS/400 server, feature 6501
5096	Interposer SC-LC Fibre
5098	Inline HVD SCSI terminator
5099	VHDCI/HD68 cable/interposer
5305	HD68-to-HD68 SCSI cable, 5 m (17 ft)
5310	HD68-to-HD68 SCSI cable, 10 m (33 ft)
5318	HD68-to-HD68 SCSI cable, 18 m (59 ft)
5325	HD68-to-HD68 SCSI cable, 25 m (82 ft)
5604	VHDCI-to-HD68 SCSI cable, 4.5 m (14 ft)
5610	VHDCI-to-HD68 SCSI cable, 10 m (33 ft)
5620	VHDCI-to-HD68 SCSI cable, 20 m
5625	VHDCI-to-HD68 SCSI cable, 25 m (82 ft)

Table 44. Feature codes for Model D32 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description
5704	VHDCI-to-VHDCI SCSI cable, 4.5 m (14 ft)
5710	VHDCI-to-VHDCI SCSI cable, 10 m (33 ft)
5720	VHDCI-to-VHDCI SCSI cable, 20 m (65 ft)
5725	VHDCI-to-VHDCI SCSI cable, 25 m (82 ft)
5805	SC-SC Fibre Channel cable, 5 m (17 ft)
5813	SC-SC Fibre Channel cable, 13 m (43 ft)
5825	SC-SC Fibre Channel cable, 25 m (82 ft)
5861	SC-SC Fibre Channel cable, 61 m (200 ft)
5907	LC-SC Fibre Channel cable, 7 m (23 ft)
5913	LC-SC Fibre Channel cable, 13 m (43 ft)
5922	LC-SC Fibre Channel cable, 22 m (72 ft)
5961	LC-SC Fibre Channel cable, 61 m (200 ft)
6005	LC-LC Fibre Channel cable, 5 m (17 ft)
6013	LC-LC Fibre Channel cable, 13 m (43 ft)
6025	LC-LC Fibre Channel cable, 25 m (82 ft)
6061	LC-LC Fibre Channel cable, 61 m (200 ft)
8750	IBM LTO Ultrium Cleaning Cartridge
8757	IBM LTO Ultrium Data Cartridge, 20-pack, unlabeled
8767	IBM TotalStorage LTO Ultrium 200 GB Data Cartridge, 20-pack
9001	Frame without drive
9210	Attached to HP-UX system
9211	Attached to Sun system
9212	Attached to Windows system
9213	Attached to other non-IBM system
9215	Attached to Linux system
9400	Attached to IBM iSeries or AS/400 server
9600	Attached to IBM pSeries or RS/6000 server
9700	No host cables from plant
9951	Power cord, 110 V ac, 4.3 m (14 ft), twistlock non-watertight connector plug type L5-20P
9986	Power cord, 250 V ac, 1.8 m (6 ft), twistlock, watertight connector, Chicago (available only in the U. S. and only at time of order)
9987	Power cord, 250 V ac 30 A, 4.3 m (14 ft), twistlock, non-watertight connector type L6-30P (available only in the U. S. and Canada, and available only at time of order)
9988	Power cord, 250 V ac 30A, 4.3 m (14 ft), twistlock, watertight connector (available only in the U. S., Canada, Japan, Korea, Philippines, and Taiwan)

Table 44. Feature codes for Model D32 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description

Notes:

1. Drive features 1454 and 1455 shipped prior to August 31, 2001 have HD68 SCSI connectors. Drive features 1454 and 1455 shipped on or after August 31, 2001 use VHDCI SCSI connectors. Drive features 1464 and 1465 are equipped with HD68 SCSI connectors.
2. Drive features 1456 and 1466 are equipped with SC connectors.
3. This feature is available on other models.
4. Withdrawn from marketing.
5. Feature code 1665 provides installation of a customer-provided LTO Ultrium Drive (previously removed by feature code 1663) into an existing UltraScalable Tape Library.
6. This feature is not a new feature, but the description has changed. Also, this feature is now for both plant and field installation.
7. Feature codes 1474 and 1475 come with VHDCI SCSI connectors.
8. Feature code 1476 comes with an LC connector.

Feature Codes for Model D42 (Expansion Frame)

Table 45. Feature codes for Model D42 of the IBM TotalStorage UltraScalable Tape Library 3584

Feature Code	Description
1452	Frame control assembly
1458	DLT 8000 LVD drive canister (see Note 1)
1459	DLT 8000 HVD drive canister (see Note 1)
1605	Additional LVD library control port (see Note 1)
1606	Additional HVD library control port (see Note 1)
1660	10/100 Ethernet support (see Note 2)
1663	Drive removal
1668	DLT drive reinstall (see Notes 3 and 4)
1669	Drive install, 1663/1459 (see Notes 1 and 5)
5098	Inline HVD SCSI terminator
5099	VHDCI/HD68 cable/interposer (see Note 3)
5604	VHDCI-to-HD68 SCSI cable, 4.5 m (14 ft)
5610	VHDCI-to-HD68 SCSI cable, 10 m (33 ft)
5620	VHDCI-to-HD68 SCSI cable, 20 m
5625	VHDCI-to-HD68 SCSI cable, 25 m (82 ft)
5704	VHDCI-to-VHDCI SCSI cable, 4.5 m (14 ft)
5710	VHDCI-to-VHDCI SCSI cable, 10 m (33 ft)
5720	VHDCI-to-VHDCI SCSI cable, 20 m (65 ft)
5725	VHDCI-to-VHDCI SCSI cable, 25 m (82 ft)
8758	DLTtape IV Cleaning Cartridge (see Note 1)
8759	DLTtape IV Data Cartridge, 21-pack, unlabeled (see Note 1)
9001	Frame without drive
9210	Attached to HP-UX system
9211	Attached to Sun system
9212	Attached to Windows system
9213	Attached to other non-IBM system
9600	Attached to IBM pSeries or RS/6000 server
9700	No host cables from plant
9951	Power cord, 110 V ac, with twistlock plug type L5-20P
9986	Power cord, 1.8 m (6 ft), watertight connector, Chicago (available only in the U. S. and only at time of order)
9987	Power cord, 250 V ac 30 A with twistlock, non-watertight connector type L6-30P (available only in the U. S. and Canada, and available only at time of order)

Table 45. Feature codes for Model D42 of the IBM TotalStorage UltraScalable Tape Library 3584 (continued)

Feature Code	Description

Notes:

1. Withdrawn from marketing.
2. This feature is available on other models.
3. Feature code 1668 provides installation of a customer-provided DLT 8000 LVD Drive canister (previously removed by feature code 1663) into an existing UltraScalable Tape Library.
4. This feature is not a new feature, but the description has changed.
5. Feature code 1669 provides installation of a customer-provided DLT 8000 HVD Drive canister (previously removed by feature code 1663) into an existing UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1459 is installed in the library.

Appendix F. Statement of Limited Warranty

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Machine: IBM TotalStorage UltraScalable Tape Library 3584

Warranty Period*: 1 year

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IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications"). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if approved by IBM to provide warranty service, will provide repair and exchange service for the Machine, without charge, under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

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When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

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You also agree to:

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3. where applicable, before service is provided
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides,
   b. secure all programs, data, and funds contained in a Machine,
   c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations, and
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IBM TotalStorage UltraScalable Tape Library 3584

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and

to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart.

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Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication.

Numbers

2:1 compression. The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression. In 2:1 compression, twice as much data can be stored with compression as can be stored without compression.

IBM TotalStorage UltraScalable Tape Library 3584. A device that can be attached to a supported server and used to write data to and read data from magnetic tape. The UltraScalable Tape Library can include up to 16 frames and 192 drives. For Ultrium Tape Drives, the maximum data capacity is 1376 TB (2752 TB at 2:1 compression).

A

A. Ampere.

ac. See *alternating current*.

accessor controller. The logic card for the cartridge accessor. The accessor controller handles accessor motion requests, including calibrations, moves, and inventory updates. It also provides centralized management for other aspects of the entire library, including configuration, insert and eject operations, automatic drive cleaning, and determination of element status.

ac line voltage. The input voltage (in volts) that is required by the UltraScalable Tape Library for normal operation.

Activity screen. The primary screen on the UltraScalable Tape Library's touchscreen. The Activity screen gives the level of firmware in the library, shows whether the library is ready, not ready, or initializing, and tells the quantity of tape cartridges currently in the I/O stations. The screen also indicates the current activity being performed, the VOLSER of the cartridge associated with the activity, and a history of previous activities. The Activity screen leads to the Main Menu.

adapter. See *adapter card*.

adapter card. A circuit board that adds function to a computer.

addressable cartridge storage slots. Within the UltraScalable Tape Library, units that can contain tape cartridges and that are recognizable to the library by both a physical address (such as F01-C05-R19) and a SCSI element (logical) address (such as 1112(X'458'). Addressable cartridge storage slots do not include I/O station slots or the non-addressable slots that are reserved for the diagnostic cartridges. The quantity of addressable cartridge storage slots per frame varies, depending on the quantity of drives that are installed in the frame.

aggregate sustained data transfer rate. For all of the drives in the UltraScalable Tape Library, the sum of their average throughput of uninterrupted data.

AL_PA. See *Arbitrated Loop Physical Address*.

alphanumeric. Pertaining to a character set that contains letters, numerals, and usually other characters, such as punctuation marks.

alternating current (ac). An electric current that reverses its direction at regularly recurring intervals.

amp. Ampere.

ampere (A, amp). A unit of measure for electric current that is equivalent to a flow of one coulomb per second, or to the current produced by one volt applied across a resistance of one ohm.

Arbitrated Loop Physical Address (AL_PA). Dynamically assigned by the fabric, an 8-bit value used to identify a device in an arbitrated loop. Device ports communicate by using AL_PAs.

automatic cleaning. A method by which the UltraScalable Tape Library automatically responds to any tape drive's request for cleaning by beginning the cleaning process. An operator enables or disables automatic cleaning by using the menus on the library's touchscreen or the UltraScalable Specialist web interface.

automatic inventory. A survey of the location of cartridges in the UltraScalable Tape Library. The library performs the survey at power-on or whenever the front door of any frame is opened and closed during operation.

B

backup and recovery application. The short-term retention of records used for restoring essential business and system files when vital data has been lost because of program or system errors or malfunctions.

Backup Recovery and Media Services (BRMS). A software program that runs on OS/400 and allows a

business to plan, control, and automate the backup, recovery, and media management services for its AS/400 systems.

bar code. A code that represents characters by sets of parallel bars of varying thickness and separation. The bars are read optically by transverse scanning.

bar code label. A slip of paper bearing a bar code and having an adhesive backing. The bar code label must be affixed to a tape cartridge to enable the library to identify the cartridge and its volume serial number.

bar code reader. Located on the dual-gripper transport mechanism of the UltraScalable Tape Library, a laser device specialized for scanning and reading bar codes and converting them into either the ASCII or EBCDIC digital character code. The bar code reader reads the bar code on the labels of cartridges or at the rear of empty storage slots.

base frame. The primary unit of the UltraScalable Tape Library (also known as Model L32). The base frame is distinguished from an expansion frame by its I/O stations and operator panel. The base frame includes a rail assembly for the cartridge accessor, and up to 12 tape drives.

bel. Ten decibels.

bit. Either of the digits 0 or 1 when used in the binary numbering system.

bpi. Bits per inch.

bridge. A storage controller that forms a bridge between two external I/O buses.

British thermal unit (Btu). The quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit at a specified temperature.

browser. A client program that initiates requests to a web server and displays the information that the server returns.

BRSM. See *Backup Recovery and Media Services*.

Btu. See *British thermal unit*.

bulk load. To manually insert large quantities of tape cartridges into a tape library's empty storage slots.

bus. See *SCSI bus*.

byte. A string consisting of a certain number of bits (usually 8) that are treated as a unit and represent a character. A byte is a fundamental data unit.

C

calibration. Adjustment, tuning.

calibration sensor. Located on the cartridge accessor of the UltraScalable Tape Library, the component that provides the means to find certain positions within the library very precisely during the calibration operation.

Call Home. A feature that allows the UltraScalable Tape Library to report failures to a support center by using a modem.

CAN. See *Controller Area Network*.

capacity. The amount of data that can be contained on storage media and expressed in bytes of data.

Capacity Expansion Feature. Applicable only to the base frame (Model L32) of the UltraScalable Tape Library, the cartridge storage slots that are located on the interior of the front door and enabled for additional storage. The Capacity Expansion Feature increases the maximum quantity of storage slots in the base frame.

cartridge. See *tape cartridge*.

cartridge accessor. The mechanism in the UltraScalable Tape Library that moves cartridges between the storage slots, tape drives, and the I/O stations. The accessor includes the X-axis motion assembly, Y-axis motion assembly, pivot assembly, cartridge gripper, bar code reader, and calibration sensor.

cartridge door. On a tape cartridge, the hinged barrier that can be opened to access, or closed to protect, the magnetic tape within the cartridge.

cartridge gripper. An electromechanical device on the cartridge accessor of the UltraScalable Tape Library that gets or puts cartridges from or to a storage slot, tape drive, or I/O station. Two grippers (Gripper 1 and Gripper 2) are located on the pivot assembly of the accessor. One gripper can grip a single cartridge.

cartridge inventory time. The amount of time required for the UltraScalable Tape Library to determine whether each cartridge storage slot in the library is empty or full.

cartridge manual rewind tool. A device that can be fitted into the reel of a cartridge and used to rewind tape into or out of the cartridge.

cartridge memory. See *LTO cartridge memory*.

cartridge move time. The time required for a cartridge accessor to pick a cartridge from a slot (or drive), move the cartridge to a drive (or slot), pivot (if required), and insert the cartridge into the drive (or slot).

cartridge storage slot. One of several containers that are mounted inside the frames of the UltraScalable Tape Library and are used to store tape cartridges.

caster. One of four wheels that are mounted in swivel frames and used to support the weight of the UltraScalable Tape Library.

cell top cap. Located on each column of storage slots within the UltraScalable Tape Library, a plastic component to which a bar code label holder can be attached. The library uses the bar code label to establish the boundary of a logical library.

circuit board. A thin plate on which chips and other electronic components are placed. Computers consist of one or more boards, often called cards or adapters.

cleaning cartridge. A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

clearance. The distance by which one object clears another or the clear space between them.

compression. The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks.

configure. To describe to a system the devices, optional features, and programs installed on the system.

controller. A device that coordinates and controls the operation of one or more input/output devices (such as sensors and actuators), and synchronizes the operation of such devices with the operation of the system as a whole.

Controller Area Network (CAN). A serial bus system that provides a communication path between the XY controller, accessor controller, all Medium Changer card packs (MCPs), and the operator panel controller. The CAN also provides a path between the accessor controller and its X-axis and Y-axis controllers.

control path. (1) Designated by the operator of the UltraScalable Tape Library, a logical path into the library through which a server sends standard SCSI Medium Changer commands to control a specific logical library. (2) A tape drive that is designated by the operator of the UltraScalable Tape Library to manage communication to and from a server and the library.

control path failover. In the event of a command failure, an optional feature of the UltraScalable Tape Library that enables the host device driver to resend the command to an alternate control path for the same logical library. The device driver initiates error recovery and continues the operation on the alternate control path without interrupting the application.

current. The quantity of charge per unit of time. Measured in amperes (amps, A).

D

daisy-chain. To serially interconnect a series of SCSI connectors for multiple devices on the SCSI bus.

data. Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data cartridge. A tape cartridge dedicated to storing data. Contrast with *cleaning cartridge*.

data compression. See *compression*.

data transfer element (DTE). In SCSI terms, a tape drive.

data transfer element (DTE) address. In SCSI terms, the physical location of a tape drive.

data transfer rate. The average number of bits, characters, or blocks per unit of time that pass between corresponding equipment in a data transmission system. The rate is expressed in bits, characters, or blocks per second, minute, or hour.

dB. Decibel.

decibel. A unit of measure that expresses the ratio of two amounts of electric or acoustic signal power that is equal to 10 times the common logarithm of this ratio.

dc. Direct current.

degauss. To make a magnetic tape nonmagnetic by means of electrical coils carrying currents that neutralize the magnetism of the tape.

degausser. A device that makes magnetic tape nonmagnetic.

device. Any hardware component or peripheral, such as a tape drive or tape library, that can receive and send data.

device driver. A file that contains the code needed to use an attached device.

diagnostic cartridge. A tape cartridge that enables the detection and isolation of errors in programs and faults in equipment.

differential. See *High Voltage Differential*.

disable. To make nonfunctional.

DLT 8000 Tape System. Located within the UltraScalable Tape Library, a high-performance, high-capacity streaming cartridge tape product designed for efficient back-up for mid-range and high-end computing systems. The drive houses the mechanism (drive head) that reads and writes data to the tape. Its native data capacity is 40 GB; with 2:1 compression, its capacity is 80 GB.

door safety switch. Located on each frame of the UltraScalable Tape Library, a mechanism that automatically turns off the power to the cartridge accessor whenever you open the front door.

drive. See *IBM Ultrium Tape Drive* or *DLT 8000 Tape System*.

drive head. The component that records an electrical signal onto magnetic tape, or reads a signal from tape into an electrical signal.

DTE. See *data transfer element*.

dual-gripper transport mechanism. Located on the cartridge accessor of the UltraScalable Tape Library and mounted on the pivot assembly, the device that contains the two grippers which get and put cartridges into storage slots, drives, or the I/O stations.

E

eject. To remove or force out from within.

electronic mail. Correspondence in the form of messages transmitted between user terminals over a computer network.

e-mail. See *electronic mail*.

enable. To make functional.

error-recovery procedures (ERP). Procedures designed to help isolate and, where possible, to recover from errors in equipment. The procedures are often used with programs that record the statistics of machine malfunctions.

Ethernet. A 10-Mbps baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and delayed retransmission.

Expanded I/O Station. On the front door of the UltraScalable Tape Library, the lower compartment into which you insert and remove cartridges into and from the library. The station can contain 20 slots for LTO Ultrium Tape Cartridges or 18 slots for DLT Tape Cartridges. Both stations are accessed by the cartridge accessor.

expansion frame. A unit that may be added to the base frame of the UltraScalable Tape Library. Also known as the Model D32 or D42, the expansion frame includes a rail assembly for the cartridge accessor and up to 12 tape drives.

F

FCB. Frame control box.

fetch rate. Pertaining to the UltraScalable Tape Library, a measure of the overall capability of the cartridge accessor without tape drive involvement. It is defined as the number of cartridges that the tape library can fetch in one hour. A fetch involves moving the cartridge from an I/O slot to a random storage slot or returning it from that storage slot to the I/O slot. Each move is considered a fetch.

Fibre Channel. A 100-MB-per-second, full-duplex, serial communications technology that is capable of interconnecting Ultrium Tape Drives and servers which are separated by as much as 11 kilometers (7 miles). Fibre Channel technology combines features of the input/output (I/O) and networking interfaces.

Fibre Channel address. For a tape drive that uses a Fibre Channel interface, an identifier (such as an AL_PA or Loop ID) that enables other device ports to communicate with that drive.

Fibre Channel cable. The cable that connects a Fibre Channel tape drive to another device. The conductive element within the cable is constructed of either copper wires or optical fibers. Generally, copper wires are used for short distances (up to 30 meters or 98 feet); optical fibers are used for longer distances. Fiber-optic cabling is referred to by mode or the frequencies of light waves that are carried by a particular cable type. Multi-mode fiber cables are generally used for distances up to 500 meters (1640 feet) and with short-wave (780 nanometer) laser light. Single-mode fiber cables are used for distances greater than 500 m (1640 feet) and with long-wave (1300 nanometer) laser light.

fiber optics. A branch of optics dealing with the transmission of light through fibers or thin rods of glass or some other transparent material of high refractive index.

file. A named set of records stored or processed as a unit.

file transfer protocol (FTP). In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

firmware. Proprietary code that is usually delivered as part of an operating system. Firmware is more efficient than software loaded from an alterable medium and is more adaptable to change than pure hardware circuitry. An example of firmware is the Basic Input/Output System (BIOS) in read-only memory (ROM) on a PC motherboard.

frame. (1) In Fibre Channel technology, a unit of transmission that includes delimiters, control characters, information, and checking characters. (2) See *library frame*.

frame control assembly. A group of parts that consist of a frame control box (FCB), one or two 37 V power

supplies for the cartridge accessor, operator panel, and I/O stations, and an MCC card pack that runs the firmware that controls the ac and dc power distribution in the UltraScalable Tape Library. The assembly also provides an RS-422 communication port to each tape drive in a frame. The FCB contains 3 circuit protectors, 10 ac outlets for powering the tape drives and all other components in that frame, and a receptacle for the incoming main ac power.

front door. Located at the front of each frame in the UltraScalable Tape Library, the swinging barrier by which entry is closed or opened to the frame.

FTP site. Any electronic repository of information that uses the File Transfer Protocol (FTP) for transferring files to and from servers. Use of an FTP site requires a user ID and possibly a password.

full duplex. Simultaneous transmission and reception of data between two nodes of a network.

G

GB. See *gigabyte*.

get. In library operation, the act of a cartridge gripper retrieving a tape cartridge from a storage slot, drive, or I/O station.

gigabyte (GB). 1 000 000 000 bytes.

H

HACMP. See *High Availability Clustered Multiprocessing*.

head. See *drive head*.

heat output. The amount of heat (in kBtu/hr) that the UltraScalable Tape Library dissipates during normal operation.

hertz (Hz). A unit of frequency equal to cycle per second.

heterogeneous. Of unlike kind.

hex, hexadecimal. (1) Pertaining to a selection, choice, or condition that has 16 possible different values or states. (2) Pertaining to a fixed-radix numeration system, with radix of 16. (3) Pertaining to a system of numbers to the base 16; hexadecimal digits range from 0 through 9 and A through F, where A represents 10 and F represents 15.

High Availability Clustered Multiprocessing (HACMP). An IBM AIX solution that automatically detects system or network failures and eliminates a single point of failure by managing failover to a recovery processor. High availability clustering refers to the linking of two or more computers, one of which can provide operation if the other one fails.

High Voltage Differential (HVD). A logic signaling system that enables data communication between a supported server and the UltraScalable Tape Library. HVD signaling uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the signal is present in both a plus and minus state, and is thereby canceled. Synonymous with *differential*.

homogeneous. Of the same kind.

host. The controlling or highest-level system in a data communication configuration. Synonymous with *server*.

host cleaning. A method that enables the host (server) to detect the need to clean a tape drive and to control the cleaning process. Host cleaning with a cleaning cartridge is only supported when automatic cleaning is disabled, and only for the logical library in which each cleaning cartridge is stored.

hub. A communications device to which nodes on a multi-point bus or loop are physically connected. Hubs are commonly used in Fibre Channel networks to improve the manageability of physical cables. They maintain the logical loop topology of the network of which they are a part, while creating a “hub and spoke” physical star layout. Unlike switches, hubs do not aggregate bandwidth. They typically support the addition or removal of nodes from the bus while it is operating.

HVD. See *High Voltage Differential*.

Hz. Hertz.

I

IBM TotalStorage LTO Ultrium 2 Tape Drive. A data-storage device that controls the movement of the magnetic tape in an IBM LTO Ultrium Tape Cartridge. The drive houses the mechanism (drive head) that reads and writes data to the tape. Its native data capacity is 200 GB per cartridge; with 2:1 compression, its capacity is up to 400 GB.

IBM TotalStorage UltraScalable Tape Library Specialist web interface. A platform-independent, web-based interface that allows a user to configure and monitor the UltraScalable Tape Library from a remote location.

IBM Ultrium 1 Tape Drive. Located within the UltraScalable Tape Library, a data-storage device that controls the movement of the magnetic tape in IBM LTO Ultrium Tape Cartridges. The drive houses the mechanism (drive head) that reads and writes data to the tape. Its native data capacity is 100 GB per

cartridge; with 2:1 compression, its capacity is up to 200 GB. The drive is also known as the IBM Ultrium Internal Tape Drive.

ID. Identifier.

IEE. See *import/export element*.

IEEE. Institute of Electrical and Electronics Engineers.

import/export element (IEE). In SCSI terms, an I/O slot.

independent software vendor (ISV). A company that makes and sells software products that run on one or more computer hardware or operating system platforms.

initial program load (IPL). (1) The initialization procedure that causes an operating system to commence operation. (2) The process by which a configuration image is loaded into storage at the beginning of a work day or after a system malfunction. (3) The process of loading system programs and preparing a system to run jobs.

initialize. To format a magnetic tape, write a label (VOLSER) on the tape, and leave the tape empty except for the system files containing the structure information. All former contents of the tape are lost.

initializing. The act of performing an inventory on the UltraScalable Tape Library.

initiator. In SCSI terms, a SCSI device that requests an I/O process to be performed by another SCSI device (a target). In many cases, an initiator can also be a target.

input/output (I/O) station. On the front door of the UltraScalable Tape Library, one or two compartments into which you insert and remove cartridges into and from the library. The upper I/O station contains 10 slots for LTO Ultrium Tape Cartridges; the lower I/O station (also called the *Expanded I/O Station*) can contain 20 slots for LTO Ultrium Tape Cartridges or 18 slots for DLT Tape Cartridges. Both stations are accessed by the cartridge accessor.

inrush current. The momentary peak current (in amperes) into the UltraScalable Tape Library when the ac line voltage is first applied.

insert. Pertaining to the UltraScalable Tape Library, a term used to describe the act of putting a tape cartridge into an I/O station.

install. (1) To set up for use or service. (2) The act of adding a product, feature, or function to a system or device either by a singular change or by the addition of multiple components or devices.

interchange. The ability to process (read or write) given tape data on any one of a set of tape devices that support the form factor and recording format of the tape data.

interchange application. The preparation of tapes for use on other systems or devices, either local or remote, or the use of tape data prepared by another system.

Internet. The worldwide collection of interconnected networks that use the Internet suite of protocols and permit public access.

interposer. An adapter-like device that allows a connector of one size and style to connect to a mating connector of a different size and style.

inventory. (1) A survey of tape cartridges in the library and frames. (2) To make an inventory of.

I/O station. See *input/output station*.

IPL. Initial program load.

ISV. See *independent software vendor*.

K

kBtu. KiloBtu.

KiloBtu. 1000 Btu's.

KiloVolt. 1000 volts.

KiloWatt. 1000 watts.

kVA. KiloVolt.

kW. KiloWatt.

L

label. See *bar code label*.

label area. On the LTO Ultrium Tape Cartridge or DLT Tape Cartridge, a recessed area next to the write-protect switch where a bar code label must be affixed.

LAN. See *local area network*.

LCD. See *liquid crystal display*.

leader pin. On the LTO Ultrium Tape Cartridge, a small metal column attached to the end of the magnetic tape. During tape processing the leader pin is grasped by a threading mechanism, which pulls the pin and the tape out of the cartridge, across the drive head, and onto a takeup reel. The head can then read or write data from or to the tape.

leveling jackscrews. Located on the bottom the UltraScalable Tape Library, one of four screw-operated jacks for raising or lowering the library.

library frame. The basic unit of the UltraScalable Tape Library. The frame includes the hardware support structure, covers, mechanisms, and parts. Two types of frames are available: base frame (Model L32) and expansion frame (Models D32 and D42).

library power switch. Located on the front of the UltraScalable Tape Library, a toggle switch that enables you to turn the power to the library on and off.

license key. A password or table that is needed to decipher encoded data.

Linear Tape-Open (LTO). A type of tape storage technology developed by the IBM Corporation, Hewlett-Packard, and Seagate. LTO technology is an "open format" technology, which means that its users have multiple sources of product and media. The "open" nature of LTO technology enables compatibility between different vendors' offerings by ensuring that vendors comply with verification standards. The LTO technology is implemented in two formats: the Accelis format focuses on fast access; the Ultrium format focuses on high capacity. The Ultrium format is the preferred format when capacity (rather than fast access) is the key storage consideration. An Ultrium cartridge has a compressed data capacity of up to 200 GB (at 2:1 compression) and a native data capacity of up to 100 GB. The Ultrium format is designed with a four-generation road map that provides for up to 1.6 TB per cartridge (2:1 compression) in Generation 4 and a compressed transfer rate of up to 320 MB per second.

line frequency. The frequency (in hertz) of the ac line voltage that the UltraScalable Tape Library requires for normal operation.

link. In Fibre Channel technology, the physical (optical) connection between two nodes of a network, which includes the combination of the link connection (the transmission medium) and two link stations, one at each end of the link connection.

liquid crystal display (LCD). A low-power display technology used in computers and other I/O devices.

load. Pertaining to the UltraScalable Tape Library and following the insertion of a tape cartridge into a cartridge storage slot, the act (performed by the cartridge accessor) of transferring the cartridge from the storage slot to the drive and of positioning the tape (performed by the tape drive) for reading or writing by the drive head.

load and unload cycle. The act of inserting a cartridge into a tape drive, loading the tape to load point, rewinding the tape into the cartridge, and ejecting the cartridge from the drive.

load point. The beginning of the recording area on magnetic tape.

load-to-ready time. After a cartridge has been inserted into a drive, the amount of time between when the drive threads the tape and when the drive becomes ready to accept server commands.

local area network (LAN). (1) A computer network located on a user's premises within a limited geographical area. Communication within a local area network is not subject to external regulations; however, communication across the LAN boundary may be subject to some form of regulation. (2) A network in which a set of devices is connected to other sets of devices for communication and that can be connected to a larger network.

logical library. A set of cartridge storage slots and tape drives that are defined as a library by an operator. The operator identifies the slots and drives to the library by their location or count. The UltraScalable Tape Library's ability to create logical libraries makes it possible for similar and dissimilar hosts (servers) to share its robotics. As a result, hosts can simultaneously run separate applications in separate logical libraries.

logical library bar code label. A specially coded label that can be affixed to the tops of storage slot columns and drives inside the UltraScalable Tape Library. The tape library reads the labels and uses them to establish the boundaries of one or more logical libraries.

Logical Library Configuration. A way of using the UltraScalable Tape Library so that its robotics are shared by homogenous (similar) and heterogeneous (dissimilar) servers. The UltraScalable Tape Library can be partitioned into individual logical libraries that independently communicate with individual servers via individual control paths.

logical unit number (LUN). A number associated with the target address of a drive. The server uses the number to identify the address of the drive.

loop ID. In Fibre Channel technology, the identifier that the UltraScalable Tape Library assigned to an Ultrium Tape Drive. The ID is based on the drive's physical location within the library and is used by other devices in the topology to communicate.

Low Voltage Differential (LVD). A low-noise, low-power, and low-amplitude electrical signaling system that enables data communication between a supported server and the UltraScalable Tape Library. LVD signaling uses two wires to drive one signal over copper wire. The use of wire pairs reduces electrical noise and crosstalk.

LTO. See *Linear Tape-Open*.

LTO cartridge memory (LTO-CM). Within each LTO Ultrium Data Cartridge, an embedded electronics and

interface module that can store and retrieve a cartridge's historical usage and other information.

LTO-CM. See *LTO cartridge memory*.

LUN. See *logical unit number*.

LVD. See *Low Voltage Differential*.

M

m. Meter.

magnetic tape. A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

Management Information Base (MIB). Units of managed information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. A collection of related MIB objects is defined as a MIB. The UltraScalable Tape Library can use the MIB to interpret problem alerts that are transmitted by SNMP traps.

manual cleaning. A method by which an operator selects a menu option from the UltraScalable Tape Library's touchscreen or UltraScalable Specialist web interface to perform cleaning on one or more of its tape drives.

MB. See *megabyte*.

Mbps. Megabits per second.

MCP. See *Medium Changer card pack*.

media. The plural of *medium*.

media capacity. See *capacity*.

media-type identifier. Pertaining to the bar code on the bar code label of the IBM LTO Ultrium Tape Cartridge, a 2-character code, L1, that represents information about the cartridge. L identifies the cartridge as one that can be read by devices that incorporate LTO technology; 1 indicates that it is the first generation of its type.

medium. A physical material in or on which data may be represented, such as magnetic tape.

Medium Changer card pack (MCP). In the UltraScalable Tape Library, a circuit board that provides a communication path to each tape drive (via the RS-422 interface) so that library commands can be funneled from the tape drives to the accessor. It includes one RS-422 interface allotted for each drive in the frame. It also provides management and service interfaces to outside servers. For each library frame that contains at least one drive, there is one MCP. The electronics of the card pack are located in the FCB.

Medium Changer Device. In SCSI terms, an instrument that moves removable storage units from and to storage slots and tape drives. The UltraScalable Tape Library is a Medium Changer Device.

megabyte (MB). 1 000 000 bytes.

metal particle tape. In the LTO Ultrium Tape Cartridge, tape that uses very small, pure metal particles (rather than oxide coatings) in the magnetic layer.

meter. In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

MIB. See *Management Information Base*.

middleware. A vague term that refers to the software between an application program and the lower-level platform functions.

micron. One millionth of a meter (.000001 m).

Microsoft Systems Management Server (SMS) and Clustered Server Environments. A solution from Microsoft that automatically detects system or network failures in Windows operating systems and eliminates a single point of failure by managing failover to a recovery processor.

mid-range systems. A set of multi-user servers with a hard disk capacity of between 50 GB and 250 GB.

mixed drive types. The concept of using both LTO Ultrium Tape Cartridges and DLT Tape Cartridges in the UltraScalable Tape Library. A library can consist of frames that house all LTO Ultrium Tape Cartridges or all DLT Tape Cartridges, but the two types of cartridges cannot be mixed in a single frame. However, both types of cartridges may be inserted or removed from the library through the base frame, provided that a lower, 18-slot I/O station is installed for the DLT Tape Cartridges.

mount. The act of making a tape available for processing by a specific tape device. A mount consists of removing the cartridge from a drive, returning it to its storage slot, collecting another cartridge from a storage slot, moving it to the drive, and loading it into the drive.

mount/demount cycle. See *mount*.

mounted. The state of a tape while it is available for processing by a specific tape device.

mount throughput. The number of cartridges that a tape library can mount in a one-hour period.

N

N/A. Not applicable.

native data capacity. The amount of data that can be stored without compression on a tape cartridge.

network. A configuration of data processing devices and software connected for information interchange.

network server. In a local area network, a personal computer that provides access to files for all of the workstations in the network.

node. In Fibre Channel technology, a communicating device.

node card. Within the UltraScalable Tape Library, one of four circuit assemblies (accessor controller card, motor driver assembly, Medium Changer card pack, and operator panel assembly) that communicate with each other over the Controller Area Network (CAN) bus.

nominal. Approximate.

nominal power. The amount of power (in kilowatts) that the UltraScalable Tape Library dissipates during normal operation.

non-addressable cartridge storage slot. A cartridge storage slot that is designated for the diagnostic cartridge, which is used during service procedures. The Model L32 base frame contains one non-addressable cartridge storage slot for the LTO Ultrium Diagnostic Cartridge and has a physical address of F01,C01,R01. The Model D42 expansion frame contains two non-addressable cartridge storage slots for the DLT Diagnostic Cartridge and has physical addresses of Fx,C01,R01 and Fx,C01,R02 (where x equals the first expansion frame for the second type of media). There are no non-addressable slots in the Model D32 expansion frame.

not ready. The operating condition that the UltraScalable Tape Library is in when the host applications cannot interact with it. For example, when the front door is open.

non-volatile memory. Types of memory that retain their contents when the power is turned off. ROM is nonvolatile, whereas RAM is volatile.

O

oersted. The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system. The oersted is the magnetic field strength in the interior of an elongated, uniformly wound solenoid that is excited with a linear current density in its winding of one abamper per 4π centimeters of axial length.

operating environment. The temperature, relative humidity rate, and wet bulb temperature of the room in which the UltraScalable Tape Library routinely conducts processing.

operating system. The master computer control program that translates the user's commands and allows software application programs to interact with the computer's hardware.

operator panel. A functional unit that controls the tape library. The unit's LCD touchscreen provides information about the operation of the UltraScalable Tape Library, and one or two I/O stations for inserting and removing cartridges.

operator panel controller. Within the UltraScalable Tape Library, a circuit board that facilitates communication between the accessor controller and the operator panel. The controller provides input to and output from the LCD, and senses and locks the I/O stations. In addition, the LCD activity and service menus are executed in the operator panel controller with support from the accessor controller and the drives (via the Medium Changer card packs).

P

partition. A fixed-size division of storage.

patch panel. Located at the rear of a UltraScalable Tape Library's base or expansion frame, an optional unit that houses the fiber cable connections between the servers and the individual drives.

Pause key. On the touchscreen of the UltraScalable Tape Library, a touch key that causes the cartridge accessor to park itself and provide clear access to the library's interior when you power-off the library or open the front door. The Pause key enables quick recovery when you power-on the library or close the front door.

PDF. See *Portable Document Format*.

pivot assembly. On the cartridge accessor of the UltraScalable Tape Library, a group of parts that provides a mounting platform for the gripper mechanism and the bar code reader. The pivot assembly is capable of 180° rotation about the vertical axis.

point load. On a floor, one or more locations where the weight of an object is concentrated.

point-to-point topology. In communications, the physical or logical arrangement of nodes in a network to facilitate data transmission between two locations without the use of any intermediate display station or computer.

port. (1) A system or network access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached. (3) The representation of a physical connection to the link hardware. A port is sometimes referred to as an adapter; however, there can be more than one port on an adapter.

Portable Document Format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact, can be distributed globally (via e-mail, the web, intranets, or CD-ROM), and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

power cord. A cable that connects a device to a source of electrical power.

power cord plug. On a power cord, the male fitting for making an electrical connection to a circuit by insertion into a receptacle.

power-off, powered-off. (1) To remove electrical power from a device. (2) The state of a device when power has been removed from it.

power-on, powered-on. (1) To apply electrical power to a device. (2) The state of a device when power has been applied to it.

power-on indicator. Located beside the library power switch on the operator panel, a green light that, when lit, indicates that dc power is available within the UltraScalable Tape Library.

power receptacle. The mounted female electrical fitting that contains the live parts of the circuit.

power supply. The electrical component of a computer system that converts standard ac current to the lower voltage dc current used by the computer. The amount of current a power supply can provide is rated in amperes.

power switch. See *library power switch*.

protocol. The meanings of, and the sequencing rules for, requests and responses used for managing a network, transferring data, and synchronizing the states of network components.

put. Pertaining to the UltraScalable Tape Library, to place, by means of a robotic device, a tape cartridge into a storage slot, drive, or I/O station.

Q

quiesce. To put a device into a temporarily inactive or inhibited state, but not remove it from the system.

R

rail system. Within the UltraScalable Tape Library, the support structure over which the cartridge accessor moves.

read. To acquire or interpret data from a storage device, from a data medium, or from another source.

ready. The operating condition that the UltraScalable Tape Library is in when the host applications can interact with it.

relative humidity. The ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.

remote support. See *Call Home*.

remove. Pertaining to the UltraScalable Tape Library, a term used to describe the act of taking a tape cartridge out of an I/O station.

repeater. A device that regenerates signals to extend the range of transmission between data stations or to interconnect two branches. A repeater is a node of a local area network.

robotics. The cartridge accessor and any associated mechanisms that move a tape cartridge within the UltraScalable Tape Library.

RS-422 interface. An electrical interface standard approved by the Electronic Industries Association (EIA) for connecting serial devices. The RS-422 standard, which supports higher data rates and greater immunity to electrical interference, is an alternative to the older RS-232 interface and uses individual differential signal pairs for data transmission. Depending on data transmission rates, RS-422 can be used at distances to 1,275 m (4,000 ft). The RS-422 interface also supports multi-point connections.

S

SAN. See *Storage Area Network*.

scalable. Pertaining to the UltraScalable Tape Library, capable of being expanded by adding up to five expansion (Model D32 or Model D42) frames. A scalable library may be used by multiple servers, but does not share cartridges and drives among them. Contrast with *ultrascalable*.

scratch cartridge. A data cartridge that contains no useful data, but can be written to with new data.

SCSI. See *Small Computer Systems Interface*.

SCSI-2. A variation of the SCSI interface. See *Small Computer Systems Interface*.

SCSI bus. (1) A collection of wires through which data is transmitted from one part of a computer to another. (2) A generic term that refers to the complete set of signals that define the activity of the Small Computer Systems Interface (SCSI).

SCSI connector. One of the set of all female and male connectors on the SCSI bus.

SCSI device. Anything that can connect into the SCSI bus and actively participate in bus activity.

SCSI element address. A value that defines a logical location in the UltraScalable Tape Library to the SCSI interface. This logical address is represented on the operator panel or UltraScalable Specialist web interface as xxxx(yyyh), where xxxx is a decimal value and yyyh is a hexadecimal value. It is assigned by the library and used by the server when the server processes SCSI commands. The SCSI element address is not unique to a storage slot, drive, or I/O slot; it varies, depending on the quantity of drives in the library, whether the Capacity Expansion feature is installed, and whether an Expanded I/O Station is included.

SCSI ID. The hexadecimal representation of the unique address (0-F) that is assigned to a SCSI device. This identifier would normally be assigned and set in the SCSI device during system installation.

search time. The average time it takes for a tape drive to locate the starting point of a block of data.

sequential access. The processing of information on a tape cartridge in a manner that requires the device to access consecutive storage locations (logical blocks) on the medium.

Sequential Access Device. In SCSI terms, a tape drive.

serial number. See *volume serial number*.

server. A functional unit that provides services to one or more clients over a network. Examples include a file server, a print server, and a mail server. The IBM pSeries, IBM iSeries, HP, and Sun are servers. Synonymous with *host*.

service clearance. Surrounding the UltraScalable Tape Library, the space required for an IBM Service Representative to perform maintenance on the unit.

service ratings. The values for criteria associated with an electrical power cord. The criteria include maximum voltage, current, phases, and wires.

ship group. The group of supplies, cords, or documentation that is shipped with the UltraScalable Tape Library.

shipping environment. The temperature, relative humidity rate, and wet bulb temperature of the environment to which the UltraScalable Tape Library is exposed when being transferred from one location to another.

short-wave cable. In Fibre Channel technology, a laser cable that uses a wavelength of 780 nanometers and is only compatible with multi-mode fiber.

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices that are managed is defined and stored in the application's Management Information Base (MIB).

single-phase power. Pertaining to the UltraScalable Tape Library, electricity that is transmitted via three wires (line, neutral, and ground), with a line-to-neutral voltage of 200-240 V ac.

Small Computer Systems Interface (SCSI). A standard used by computer manufacturers for attaching peripheral devices (such as tape drives, hard disks, CD-ROM players, printers, and scanners) to computers (servers). Pronounced ″scuzzy.″ Variations of the SCSI interface provide for faster data transmission rates than standard serial and parallel ports (up to 160 megabytes per second). The variations include:

- Fast/Wide SCSI: Uses a 16-bit bus, and supports data rates of up to 20 MBps.
- SCSI-1: Uses an 8-bit bus, and supports data rates of 4 MBps.
- SCSI-2: Same as SCSI-1, but uses a 50-pin connector instead of a 25-pin connector, and supports multiple devices.
- Ultra SCSI: Uses an 8- or 16-bit bus, and supports data rates of 20 or 40 MBps.
- Ultra2 SCSI: Uses an 8- or 16-bit bus and supports data rates of 40 or 80 MBps.
- Ultra3 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.
- Ultra160 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.

SNMP. See *Simple Network Management Protocol*.

Specialist web interface. A platform-independent, web-based interface that allows a user to configure and monitor the UltraScalable Tape Library from a remote location.

speed matching. The ability of an Ultrium 2 Tape Drive to adjust its native data rate as closely as possible to the net host data rate (after data compressibility has been factored out).

stand-alone. Pertaining to operation that is independent of any other device, program, or system.

StE. See *storage element*.

Storage Area Network (SAN). A high-speed subnetwork of shared storage devices. A SAN's architecture makes all storage devices available to all servers on a LAN or WAN. As more storage devices are added to a SAN, they too will be accessible from any server in the larger network. Because stored data does not reside directly on any of a network's servers, server

power is used for business applications, and network capacity is released to the end user.

storage element (StE). In SCSI terms, a cartridge storage slot.

storage environment. The temperature, relative humidity rate, and wet bulb temperature of the environment in which the UltraScalable Tape Library is nonoperational and being kept for future use.

sustained data transfer rate. Between the server and the tape drive, the average transfer rate of data across the SCSI interface to and from the tape drive during a transition from one end of the tape to the other end.

switch. A network infrastructure component to which multiple nodes attach. Unlike hubs, switches typically have the ability to switch node connections from one to another. A typical switch can facilitate several simultaneous bandwidth transmissions between different pairs of nodes.

T

TapeAlert. A patented technology from Hewlett-Packard that monitors the status of a tape device and media, and detects problems as they occur.

TapeAlert flags. Status and error messages that are generated by the TapeAlert utility and display on the host console. The messages indicate the type of problem and tell how to resolve it.

tape cartridge. A removable storage device that consists of a housing containing a belt-driven magnetic tape wound on a supply reel and a takeup reel.

tape drive. See *IBM Ultrium Tape Drive* or *DLT 8000 Tape System*.

target. A SCSI device that performs an operation requested by the initiator. A target can also be an initiator.

TB. Terabyte.

TCP/IP. See *transmission control protocol/Internet protocol*.

terabyte. 1 000 000 000 000 bytes.

terminate, termination. To prevent unwanted electrical signal reflections by applying a device (a terminator) that absorbs the energy from the transmission line.

terminator. (1) A part used to end a SCSI bus. (2) A single-port, 75-Ω device that is used to absorb energy from a transmission line. Terminators prevent energy from reflecting back into a cable plant by absorbing the radio frequency signals. A terminator is usually shielded, which prevents unwanted signals from entering or valid signals from leaving the cable system.

Tivoli Storage Manager (TSM). Tivoli Storage Manager (TSM) is an enterprise-wide storage management application for the network. It provides automated storage management services to multivendor workstations, personal computers, and local area network (LAN) file servers.

topology. In communications, the physical or logical arrangement of nodes in a network, especially the relationships among nodes and the links between them.

touch keys. On the touchscreen of the UltraScalable Tape Library, an array of small, touch-sensitive keypads that lets you select and navigate through menus. To acknowledge that it has been pressed, a touch key initiates an audible beep (if enabled) whenever you press it. The audible beep is the default.

touchscreen. See *liquid crystal display*.

track. A linear or angled pattern of data written on a tape surface.

transfer rate. See *data transfer rate*.

transmission control protocol/Internet protocol (TCP/IP). (1) The Transmission Control Protocol and the Internet Protocol, which together provide reliable end-to-end connections between applications over interconnected networks of different types. (2) The suite of transport and application protocols that run over the Internet Protocol.

TSM. See *Tivoli Storage Manager*.

two-node arbitrated loop. In Fibre Channel technology, the connection of two nodes that communicate directly (without the use of a switch) and use the same protocol.

two-node switched fabric loop. In Fibre Channel technology, the connection of two or more nodes that may not use the same protocol and communicate by using a switch.

two-phase power. Pertaining to the UltraScalable Tape Library, electricity that is transmitted via three wires (line, line, and ground), with a line-to-line voltage of 200-240 V ac. Sometimes referred to as *single phase power*.

U

Ultra SCSI. See *Small Computer Systems Interface*.

Ultra160 SCSI. See *Small Computer Systems Interface*.

Ultra2 SCSI. See *Small Computer Systems Interface*.

Ultra3 SCSI. See *Small Computer Systems Interface*.

ultrascalable. Pertaining to the UltraScalable Tape Library, capable of being expanded by adding up to five expansion (Model D32 or Model D42) frames. An ultrascalable library may be used by multiple servers and can share cartridges and drives among them. Contrast with *scalable*.

Ultrium Tape Drive. See *IBM Ultrium Tape Drive*.

uniform resource locator (URL). The address of an item on the World Wide Web. It includes the protocol followed by the fully qualified domain name (sometimes called the host name) and the request. The web server typically maps the request portion of the URL to a path and file name. For example, if the URL is http://www.networking.ibm.com/nsg/nsgmain.htm, the protocol is http; the fully qualified domain name is www.networking.ibm.com; and the request is /nsg/nsgmain.htm.

unload. Pertaining to the UltraScalable Tape Library, a term used to describe the act of the drive unthreading the tape from the internal tape path and returning the leader block to the tape cartridge.

URL. See *uniform resource locator*.

V

V ac. Volts ac (alternating current).

vital product data (VPD). Pertaining to the UltraScalable Tape Library, information about a product such as a library, drive, or node card. The VPD may include a machine type, model number, serial number, part number, or level of firmware.

void. In character recognition, the inadvertent absence of ink within a character outline.

VOLSER. Volume serial number.

volt. The SI (international) unit of potential difference and electromotive force, formally defined to be the difference of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt.

volume serial number (VOLSER). A number that a computer assigns to a tape cartridge when it prepares (initializes) the cartridge for use.

VPD. Vital product data.

W

W. Watts.

watt. A metric unit of measure of power; the power required to keep a current of one ampere flowing under a potential drop of one volt; about 1/736 of one horsepower.

web. See *World Wide Web*.

wet bulb temperature. The temperature at which pure water must be evaporated adiabatically at constant pressure into a given sample of air in order to saturate the air under steady-state conditions. Read from a wet-bulb thermometer.

World Wide Node Name. In Fibre Channel technology, the fixed, 64-bit name assigned to a device by its manufacturer and used to identify participants in a topology. The World Wide Node Name will be unique if the manufacturer has registered a range of addresses with the IEEE.

World Wide Port Name. Within a parent node, a unique 64-bit name that is assigned to a node port. The World Wide Port Name aids the accessibility of the port.

World Wide Web. A network of servers that contain programs and files. Many of the files contain hypertext links to other documents available through the network.

write. To make a permanent or transient recording of data in a storage device or on a data medium.

write protected. A tape cartridge is write protected if some logical or physical mechanism causes the device that is processing the tape to prevent the program from writing on the tape.

write-protect switch. Located on the LTO Ultrium Tape Cartridge or DLT Tape Cartridge, a switch that prevents accidental erasure of data. Pictures of a locked and unlocked padlock appear on the switch. When you slide the switch to the locked padlock, data cannot be written to the tape. When you slide the switch to the unlocked padlock, data can be written to the tape.

X

X-axis and Y-axis motion assemblies. Within the UltraScalable Tape Library, a group of parts that includes a controller (circuit board) for the Controller Area Network interface, servo motor, pinion drive gear and lead screw. Provides the motive force to move the accessor side to side (on the X-axis) and up and down (on the Y-axis).

Y

Y-axis motion assembly. See *X-axis and Y-axis motion assemblies*.

Z

zoning. A method of subdividing a storage area network into disjoint zones, or subsets of nodes on the network. Storage area network nodes outside a zone are invisible to nodes within the zone. Moreover, with switched SANs, traffic within each zone may be physically isolated from traffic outside the zone.

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Planning and Operator Guide

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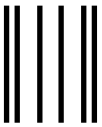

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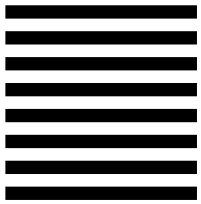

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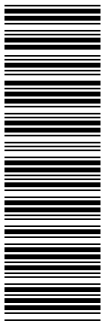

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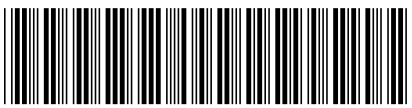

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