3584 UltraScalable Tape Library

Planning and Operator Guide

GA32-0408-03

3584 UltraScalable Tape Library

Planning and Operator Guide

GA32-0408-03

Note!

Before using this information and the product it supports, read the information in “Safety and Environmental Notices” on page xiii and “Appendix G. Notices” on page 249.

Fourth Edition (July 2001)

This edition applies to the *IBM® 3584 UltraScalable Tape Library Planning and Operator Guide* and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces GA32-0408-02.

Contents

Figures

Tables

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 3584 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 3584 Tape Library.

Laser Safety and Compliance

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

Class II Laser Product

The 3584 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.

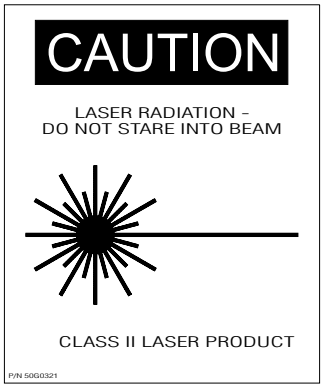


Figure 1. Laser Safety Caution Label

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 3584 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 3584 UltraScalable Tape Library. It includes the following chapters:

"Chapter 1. Introduction" on page 1 provides an overview of the 3584 Tape Library, describes how it can process both Linear Tape-Open™ (LTO™) Ultrium Tape Cartridges and DLTtape™ IV Tape Cartridges, identifies the servers to which it can attach, lists the operating systems that it supports, summarizes its primary components, describes the tape drives that it uses, outlines performance considerations, and describes methods for cleaning its tape drives.

"Chapter 2. Physical Planning Specifications" on page 25 lists dimensions of the 3584 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 and Basic Operating Procedures" on page 35 describes the primary parts of the 3584 Tape Library and provides a table that lists fundamental and advanced operating procedures. It gives an overview of the 3584 Specialist web interface, and describes basic procedures such as powering the library on and off, inserting and removing data and cleaning cartridges, cleaning a drive, and changing the library's configuration. Advanced procedures are described in Chapter 4.

"Chapter 4. Advanced Operating Procedures" on page 79 provides additional procedures for operating the 3584 Tape Library, including how to determine the status of the accessor, drives, control ports, I/O stations, storage slots, and cartridges. The chapter also describes how to perform an inventory of the library or a frame, move a specific tape cartridge, and configure logical libraries. Instructions are given for operating the library by using its web interface or its operator panel.

"Chapter 5. Using Ultrium Media" on page 161 describes the data and cleaning cartridge to use in an Ultrium Tape Drive™. 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 about storing, shipping, and handling cartridges, and offers information about where to order cartridges and supplies.

"Chapter 6. Using DLT Media" on page 177 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 191 describes the requirements of the Fibre Channel interface, lists the types of topologies the 3584 Tape Library supports, discusses the address scheme for the Fibre Channel tape drives, and provides information about connectors and adapters.

"Chapter 8. Using the SCSI Interface" on page 197 describes the requirements of the SCSI interface, and provides information about SCSI cables, connectors, and interposers.

"Chapter 9. Problem Determination" on page 203 lists symptoms of possible problems with the 3584 Tape Library and recommends actions to take.

"Appendix A. Library Capacity" on page 209 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 211 describes several key components located within the 3584 Tape Library. Included are the rail assembly, cartridge accessor, dual-gripper transport mechanism, accessor controller, operator panel controller, frame control box, Medium Changer card pack, and drive and power supply compartment.

"Appendix C. TapeAlert Flags" on page 219 lists TapeAlert messages that are supported by the Ultrium Tape Drive, DLT 8000 Tape System, and 3584 Tape Library. The messages may aid during problem determination.

"Appendix D. Locations and Addresses of SCSI Elements" on page 227 shows the physical locations of storage 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 (and the locations of the I/O slots) to their corresponding SCSI element addresses.

"Appendix E. Feature Codes" on page 239 gives the codes that you need when ordering features for the 3584 Tape Library.

"Appendix F. Statement of Limited Warranty" on page 245 contains the warranty statement for the 3584 Tape Library.

"Appendix G. Notices" on page 249 tells where and how to send your comments about this book. It also gives information about the electronic emission regulations that pertain to the 3584 Tape Library in the United States and other countries.

Related Publications

Refer to the following publications for additional information about the 3584 UltraScalable Tape Library. To ensure that you have the latest publications, visit the web at `http://www.ibm.com/storage/hardsoft/tape/pubs/pubs3584.html`.

3584 UltraScalable Tape Library Publications

- *IBM 3584 UltraScalable Tape Library Maintenance Information*, SA37-0426
- *IBM 3584 UltraScalable Tape Library SCSI Reference*, WB1108
- *The IBM LTO Ultrium Tape Libraries Guide*, SG24-5946

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)

pSeries and RS/6000 Publications

- *AIX Version 3.2 Getting Started*, GC23-2521
- *AIX Version 4.3 Problem Solving Guide and Reference*, SC23-4123
- *AIX Version 4.3 Messages Guide and Reference*, SC23-4129
- *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

- `http://www.ibm.com/storage/hardsoft/tape/pubs/pubs3584.html` (for a list of compatible software)
- `http://www.ibm.com/storage/lto` (for bar code and bar code label specifications for LTO Ultrium Tape Cartridges)
- *StorageSmart by IBM Ultrium Tape Drive Models T200 and T200F Setup, Operator, and Service Guide*, GA32-0435.
- *StorageSmart by IBM Ultrium External Tape Drive TX200, StorageSmart by IBM Ultrium Tape Drive Models T200 and T200F, and IBM 3580 Ultrium Tape Drive SCSI Reference*, WB1109
- *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*, WB1304 (to order, visit `ftp://ftp.software.ibm.com/storage/devdrvr`)
- *Quantum DLT 8000 Tape System Product Manual*
- *IBM General Information Installation Manual-Physical Planning*, GC22-7072

Chapter 1. Introduction

The IBM 3584 UltraScalable Tape Library is a stand-alone device that provides reliable, automated tape handling and storage for unattended mid-range systems and network servers. 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 five additional storage units, called expansion frames. Each frame in the library may contain up to 12 Ultrium Tape Drives or DLT 8000 Tape Systems, but may not contain a mix of both.

To match your system capacity and performance needs, you can tailor the 3584 UltraScalable Tape Library to take advantage of the following features:

- Use of up to 72 Ultrium Tape Drives or 60 DLT 8000 Tape Systems
- Aggregate sustained data transfer rate from 108 GB to 7.8 TB per hour for Ultrium Tape Drives (at 2:1 compression)
- Compressed data capacity of 496.2 TB for Ultrium Tape Drives (at 2:1 compression)
- For the IBM Ultrium Tape Drive, support of any combination of interfaces, including Fibre Channel, Low Voltage Differential (LVD) Ultra2 SCSI, and High Voltage Differential (HVD) Ultra SCSI
- 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

Figure 2 shows a 3584 UltraScalable Tape Library that contains six frames.

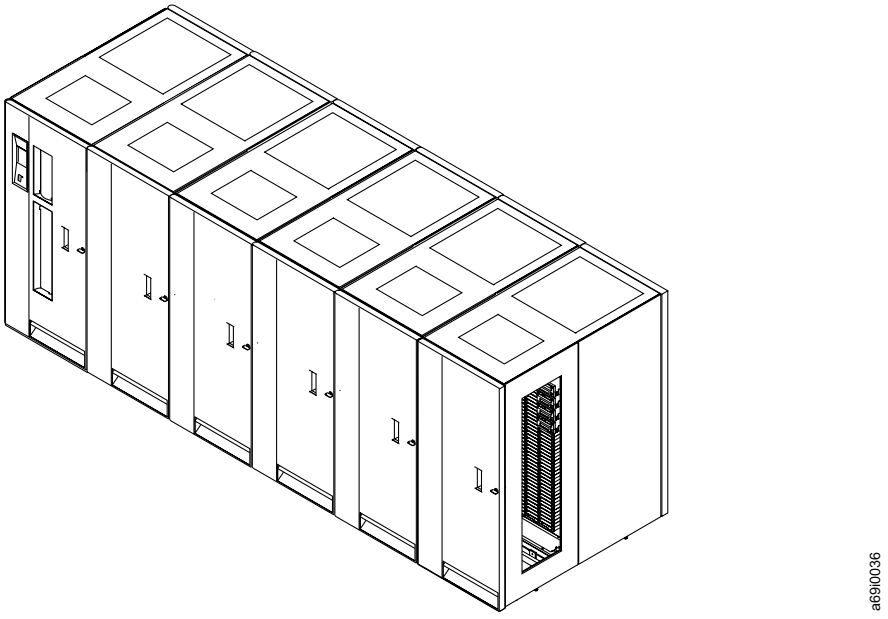


Figure 2. The 3584 UltraScalable Tape Library. The library can contain up to six frames.

The 3584 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.

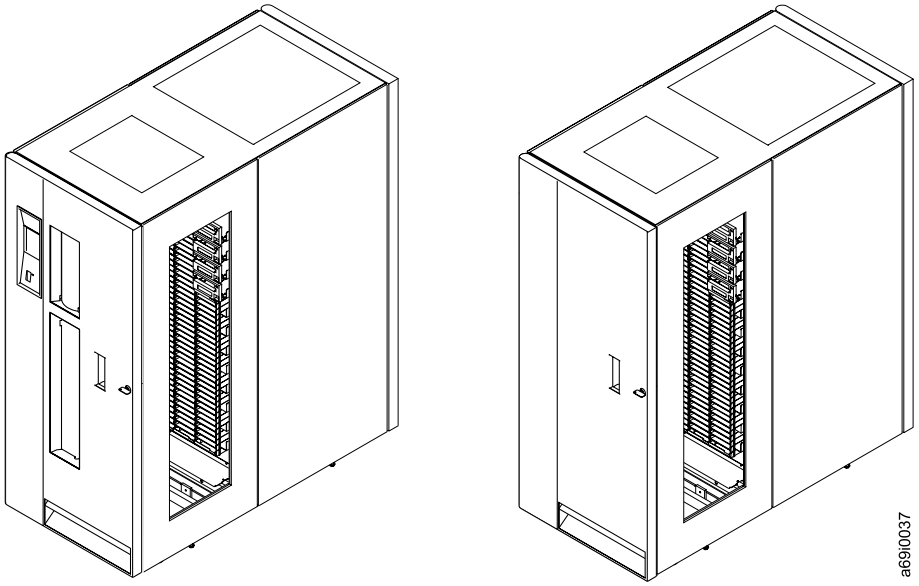


Figure 3. Frames in the 3584 UltraScalable Tape Library. Model L32 (the base frame) is on the left. Model D32 (the expansion frame) is on the right and attaches to the base frame. Models L32 and D32 house LTO Ultrium Tape Cartridges; Model D42 (not shown) houses DLTtape IV Tape Cartridges.

Mixed Media

The 3584 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 gripper) can handle both LTO and DLT media.

If you use mixed media, you must configure the LTO and DLT elements (drives, storage slots, grippers) into separate logical libraries. See “Configuring the Library with Partitions” on page 108. For information about labeling logical libraries that contain mixed media, see “Guidelines for Applying Labels” on page 115.

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 mixed media, 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 mixed media. For LTO Ultrium Tape Cartridges, the lower I/O station contains 20 slots; for DLTtape IV, the lower I/O station contains 18 slots.

A frame cannot combine the two types of cartridges. However, in a library that uses mixed media, 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 firmware that lets you use the storage slots inside the front door of the 3584 UltraScalable Tape Library. With the Capacity Expansion Feature installed, the library offers 141 slots in the Model L32 (for Ultrium Tape Cartridges). 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 and have your IBM Service Representative install it at a later date. 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. Library Capacity” on page 209.

Multi-path Architecture

The 3584 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. The Multi-Path Architecture is compliant with the following attachment interfaces:

- Small Computer Systems Interface (SCSI)
- Fibre Channel

Whether partitioned or not, the 3584 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 allow the cartridge inventory of the 3584 UltraScalable Tape Library to be shared by multiple IBM @server® iSeries and AS/400® servers, or by other open systems hosts that run the same applications. Additional control paths also reduce the possibility that failure in one control path will cause the entire library to be unavailable.

For details about configuring the library to share robotics, see “Library Sharing” on page 13.

Supported Servers and Software

The 3584 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.ibm.com/storage/lto` or contact your IBM Sales Representative.

Attachments to the 3584 UltraScalable Tape Library include (but are not limited to) those shown in Table 1.

Table 1. Attachments to the 3584 UltraScalable Tape Library

Server	Operating System
IBM @server iSeries and IBM AS/400 (see Note)	IBM OS/400® (for LTO Ultrium Tape Drives only)
IBM @server pSeries and IBM RS/6000®	IBM AIX®
IBM @server xSeries and Netfinity®	Microsoft® Windows NT® and Windows 2000®
HP	Hewlett-Packard HP-UX
Intel®-compatible servers	Microsoft Windows NT and Windows 2000
Sun® SPARC™ PCI	Sun Solaris®
Sun® SPARC™ Sbus	Sun Solaris®
Note: The IBM @server iSeries and AS/400 servers do not support the Model D42 frame.	

Software support for the 3584 UltraScalable Tape Library is planned or available for the following products. To get a comprehensive list of compatible software, visit the web at `http://www.ibm.com/storage/lto` or contact your IBM representative.

Note: IBM does not provide application software with the 3584 UltraScalable Tape Library. To order software, contact your IBM Sales Representative, IBM Business Partner, or an independent software provider.

- Tivoli® Storage Manager™ (formerly IBM ADSTAR® Distributed Storage Manager (ADSM))
- Backup Recovery and Media Services (BRMS)
- Computer Associates ARCserve
- Dantz Retrospect
- Legato Systems NetWorker
- SCH Technologies REELlibrarian and REELbackup
- VERITAS NetBackup and Backup Exec
- Help/Systems, Inc. Robot/SAVE

Supported Device Drivers

IBM provides device driver support for the Ultrium Tape Drive and the robotics in the 3584 UltraScalable Tape Library (including the Model D42 frame). IBM maintains the latest levels of device drivers and driver documentation on the Internet. You can access this material from your browser or through the IBM FTP site by doing the following:

- Using a browser, type one of the following:

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

  `ftp://207.25.253.26/storage/devdrvr`
- From an IBM FTP site, 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`

Note: If you do not have Internet access and you need information about device drivers, contact your IBM Sales Representative.

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 directory:

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

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

- AIX/
- HPUX/
- Solaris/
- WinNT/
- Win2000/

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

Attachment Interfaces

The 3584 UltraScalable Tape Library supports three types of attachment interfaces: Fibre Channel, LVD SCSI, and HVD SCSI. The sections that follow describe each.

Fibre Channel

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.

In addition to using SCSI interfaces to attach to servers, the 3584 Tape Library can also use a Fibre Channel interface. Fibre Channel is a 100-MB-per-second, full-duplex, serial-communications technology capable of interconnecting Ultrium Tape Drives and servers that are separated by as much as 11 kilometers (7 miles). 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). Fibre Channel technology offers a new 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 3584 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 191.

LVD SCSI

The 3584 UltraScalable Tape Library operates as a set of SCSI-3 devices. Any Ultrium Tape Drive in the library can attach to a server through a Low Voltage Differential (LVD) Ultra2 SCSI interface, and any DLT 8000 Tape System can attach to a server through a Fast/Wide LVD 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 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 239.

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 standards, this type of attachment allows cable lengths of up to 25 m (81 ft) with the appropriate cable and terminator.

For more information about the SCSI interface, see “Chapter 8. Using the SCSI Interface” on page 197.

HVD SCSI

The 3584 UltraScalable Tape Library operates as a set of SCSI-3 devices. Any Ultrium Tape Drive in the library can attach to a server through a High Voltage Differential (HVD) Ultra SCSI interface and any DLT 8000 Tape System can attach to a server through a Fast/Wide 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 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 239.

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 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.

For more information about the SCSI interface, see “Chapter 8. Using the SCSI Interface” on page 197.

IBM 3584 UltraScalable Tape Library Specialist

The IBM 3584 UltraScalable Tape Library Specialist is one of a growing family of IBM storage interfaces that enables operators and administrators to manage storage devices from any location in an enterprise. The 3584 Specialist is a web-based user interface that communicates directly with your 3584 Tape Library, allowing you to perform a full range of end user, operator, and administrator tasks without being at the operator panel.

For information about using the 3584 Specialist web interface, see “Operating the Library from the Web” on page 53.

Remote Support

Optional remote support is available for the 3584 Tape Library through its Call Home capability. This feature minimizes the time it takes to correct library problems. It uses a modem connection to report failures that are detected by the library. Whenever the library detects a failure, 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.

The Call Home feature handles library problems (including those related to loading and unloading the drive); it does not handle drive read/write or server interface problems.

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 2 indicates the requirements.

Table 2. 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)
3 or more	Remote Support Attachment (cable; feature code #2712)

Library Components

The 3584 UltraScalable Tape Library consists of the major components shown in Figure 4 on page 11 (the figure depicts Model L32). For a more complete description of each component, see “Chapter 3. Main Components and Basic Operating Procedures” on page 35 or “Appendix B. Technical Components” on page 211.

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 3584 Tape Library and used to store tape cartridges.

7 IBM LTO Ultrium Tape Drive or DLT Tape System
Mounted in the 3584 Tape Library, one or more units that read and write data that is stored on tape cartridges. The Ultrium Tape Drive uses 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 3584 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.

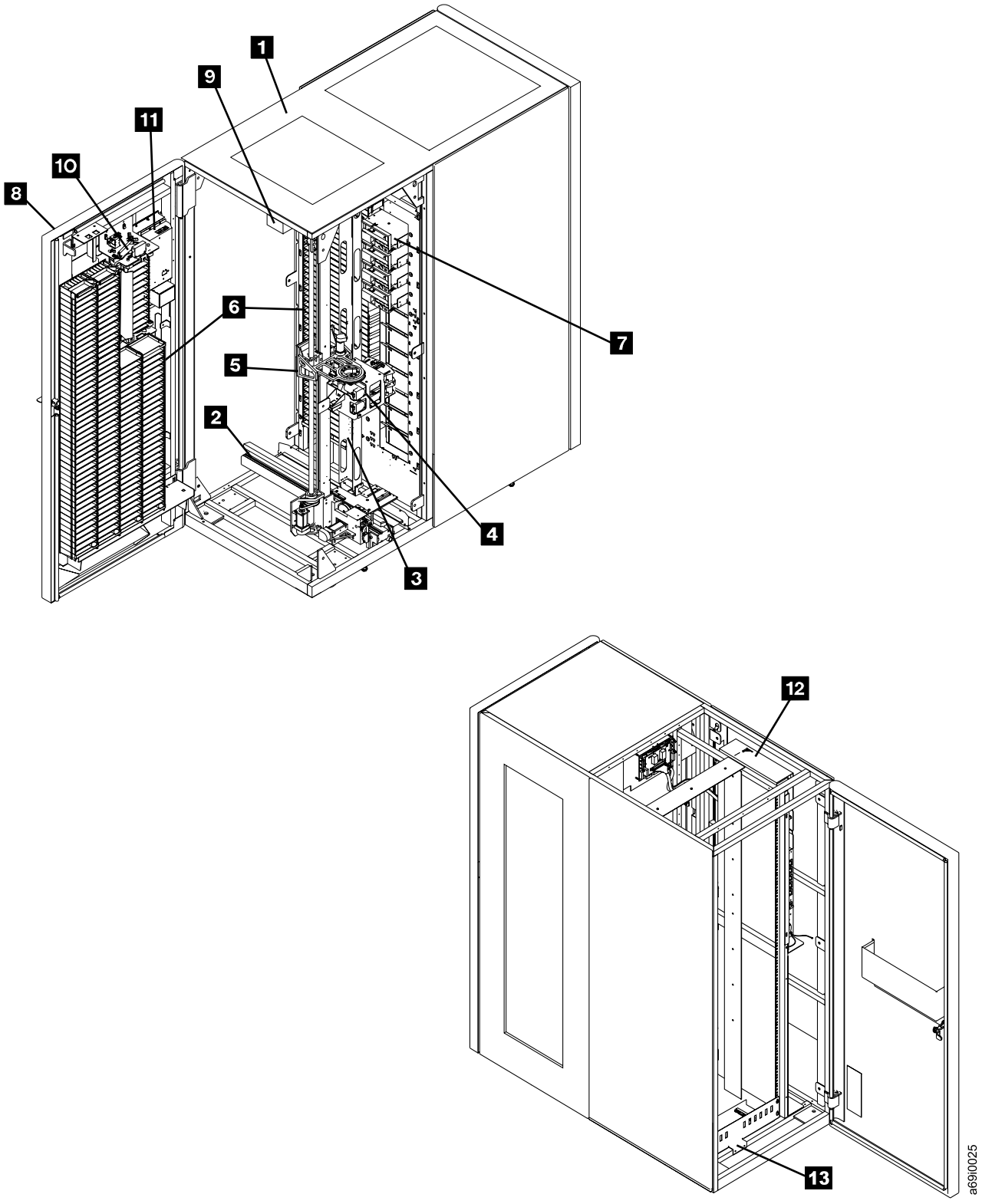


Figure 4. Components of the 3584 UltraScalable Tape Library. The front and rear of the Model L32 library are shown.

Tape Drives

Attention: Do not mix Ultrium Tape Drives and DLT 8000 Tape Systems in the same frame or an error will occur when you configure the library.

The Ultrium Tape Drive and the DLT 8000 Tape System are high-performance, high-capacity data-storage units that can be installed in the 3584 UltraScalable Tape Library. Up to 12 Ultrium Tape Drives or DLT 8000 Tape Systems may be installed in each frame of the library. However, the two types of drives may not be installed in the same frame.

Table 3 lists the characteristics of the Ultrium Tape Drive and the DLT 8000 Tape System.

Table 3. Characteristics of the Ultrium Tape Drive and the DLT 8000 Tape System

Characteristics	Tape Drive	
	Ultrium Tape Drive	**DLT 8000 Tape System**
Native sustained data rate	15 MB per second	6 MB per second
Compressed data rate (at 2:1 compression)	30 MB per second	12 MB per second
Supported interface (see Note)	LVD Ultra2 SCSI	Fast/Wide LVD SCSI
	HVD Ultra SCSI	Fast/Wide HVD SCSI
	Fibre Channel	--
Note: 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.		

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 media, 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 LTO Ultrium Data Cartridge features a native data capacity of 100 GB (200 GB at 2:1 compression). The DLTtape IV Data Cartridge features a native data capacity of 40 GB (80 GB at 2:1 compression).

For additional information about the tape cartridges that can be used by the 3584 UltraScalable Tape Library, see “Chapter 5. Using Ultrium Media” on page 161 and “Chapter 6. Using DLT Media” on page 177.

Library Sharing

The 3584 UltraScalable Tape Library's default configuration allows a single application to operate the library through a single control path (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). 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 3584 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 IBM @server pSeries servers).

From the 3584 UltraScalable Tape 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 5 on page 14) requires no special capabilities from the server or application. (For more information, see "Using Multiple Logical Libraries" on page 16.)
- 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 5 on page 14). This configuration is not applicable to IBM @server iSeries or AS/400 servers, and requires special capabilities from the application.
  - 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 5 on page 14). This configuration is not applicable to IBM @server iSeries or AS/400 servers, and requires special capabilities from the application.
  - 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 and must be used with by IBM @server iSeries or AS/400 servers. For more information, see "Using Multiple Control Paths" on page 17.

    Note: The IBM @server 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. Many configurations are possible, and you can design them according to your business needs.

Example Configurations for a Library with Ultrium Tape Drives

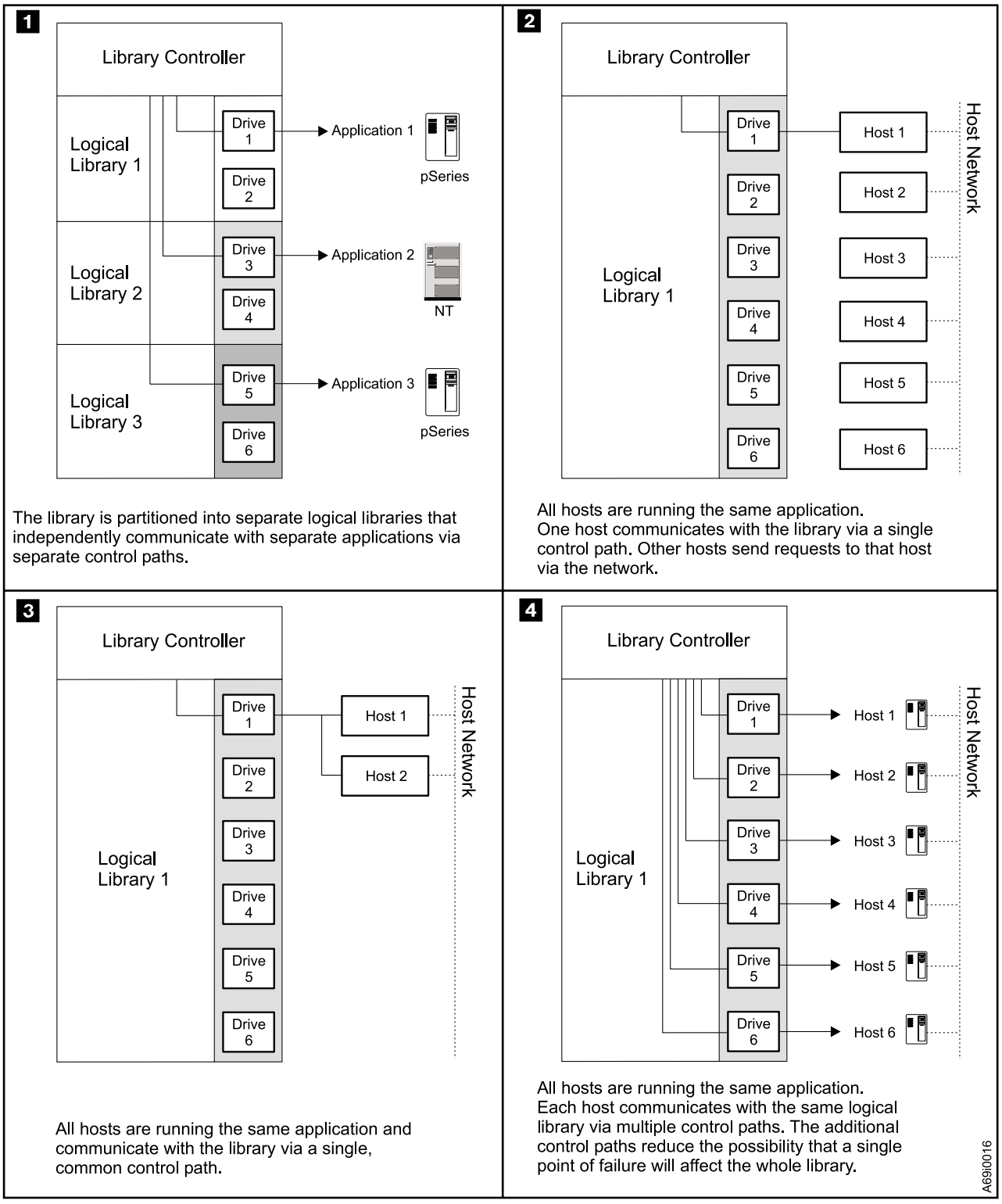


Figure 5. Examples of Configurations for a 3584 UltraScalable Tape Library that Uses Ultrium Tape Drives. Lines from one or more drives to the library controller represent control paths.

Example Configurations for a Library with DLT 8000 Tape Systems

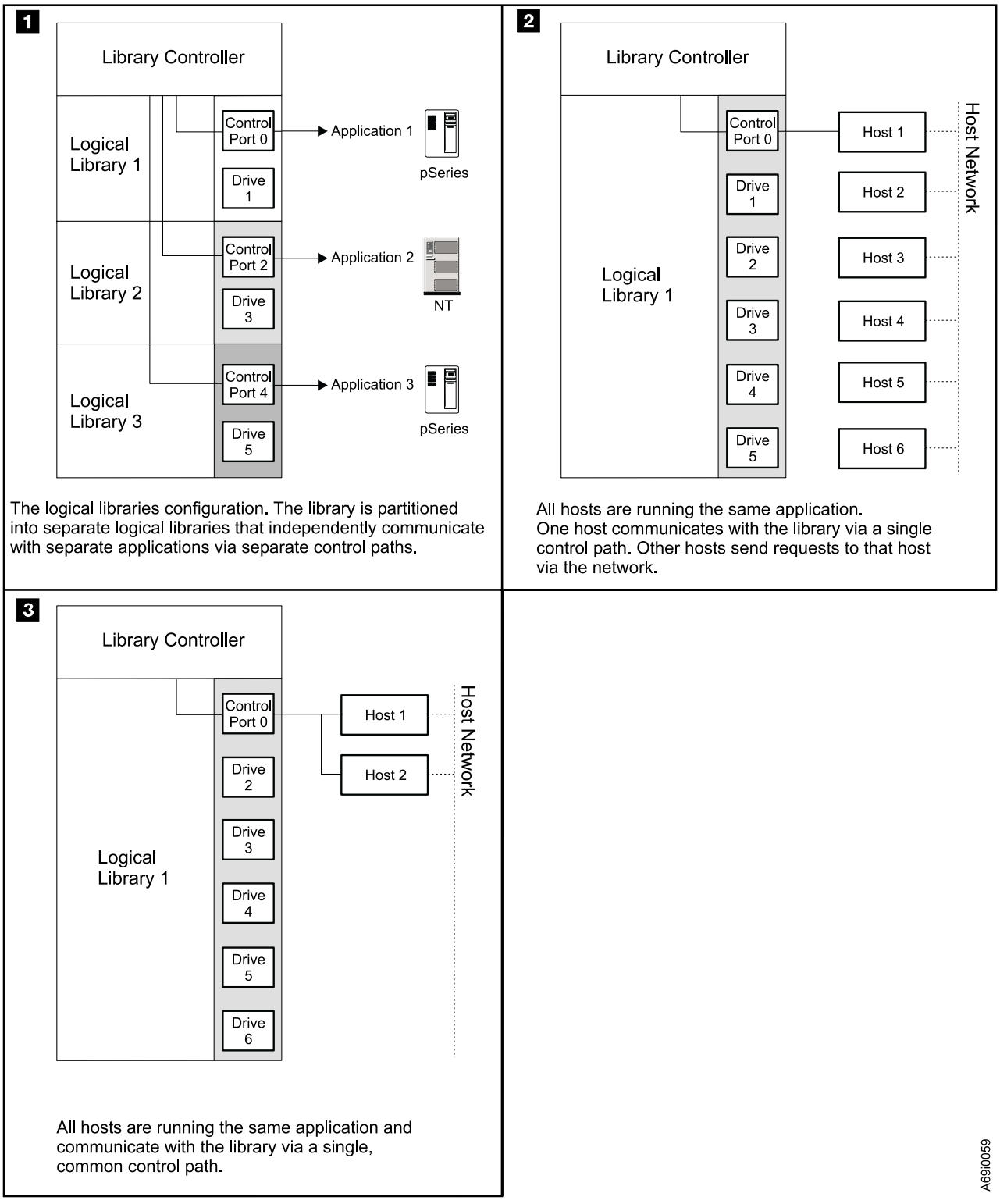


Figure 6. Examples of Configurations for a 3584 UltraScalable Tape Library that Uses DLT 8000 Tape Systems. Lines from one or more drives to the library controller represent control paths.

Using Multiple Logical Libraries

You can create multiple logical libraries that allow a single library to be used by multiple servers 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). 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 mixed media. That is, you must configure LTO and DLT elements (drives, storage slots, I/O slots, and grippers) into separate logical libraries.

Multiple logical libraries are an effective way for the 3584 UltraScalable Tape Library to simultaneously back up and restore data from unshared 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.

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.

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 22.

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 108). 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 3584 Specialist configuration wizard or the operator panel menus to create the logical libraries (see "Configuring the Library by Using Menus" on page 117). 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 3584 UltraScalable Tape Library, see “Configuring the Library without Partitions” on page 104 or “Configuring the Library with Partitions” on page 108.

Using Multiple Control Paths

In addition to partitioning storage slots and drives into logical libraries, you can also configure any logical library so that it shares its entire cartridge inventory between multiple IBM @server iSeries or AS/400 servers, or between other open systems hosts that run the same application. When you add one or more control paths (by enabling LUN 1 of Ultrium Tape Drives or by installing control ports with the DLT 8000 Tape Systems), multiple servers can access any single, configured logical library. Additional control paths also reduce the possibility that failure in one control path will cause a breakdown in the entire library.

You can configure the 3584 UltraScalable Tape Library so that servers send commands to it through the multiple control paths. Access by the server to the library is on a first-come, first-served basis. Each control path port for a logical library can accept commands while the library is in use by another port.

Note: Microsoft Windows 2000 Removable Storage Manager (RSM) does not support multiple control paths within a logical library.

To add or remove additional control paths, see “Changing a Control Path” on page 133.

Physical and Logical Addresses

Each element in the 3584 UltraScalable Tape Library (the cartridge storage slots, I/O storage slots, and tape drives) has two addresses:

- Physical address
- Logical SCSI element address

When initiating an operation such as moving a tape cartridge or performing manual cleaning, you can use the physical or logical address to specify a location in the library.

The physical address consists of frame, column, and row identifier that defines a unique physical location in the library. The address is represented as:

- `Fx,Cyy,Rzz` for a storage slot (where `F` equals the frame and `x` equals its number, `C` equals the column and `yy` equals its number, and `R` equals the row and `zz` equals its number).
- `Fx,Rzz` for a tape drive and I/O storage slot (where `F` equals the frame and `x` equals its number, and `R` equals the row and `zz` equals its number).

The SCSI element address 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 server when the server processes SCSI commands. The SCSI element address is not unique to a storage slot; it varies, depending on the quantity of drives in the library. “Appendix D. Locations and Addresses of SCSI Elements” on page 227 lists the SCSI element addresses for storage slots, I/O slots, and drives.

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 Drive and the DLT Tape System. Table 4 lists the performance characteristics of each.

Table 4. Performance Characteristics of the Ultrium Tape Drive and the DLT Tape System

Performance Characteristic	Tape Drive	
	Ultrium Tape Drive	**DLT Tape System**
Native sustained data rate	15 MB per second	6 MB per second
Compressed data rate (at 2:1 compression)	30 MB per second	12 MB per second
Maximum sustained data rate (at maximum compression)	60 MB per second	12 MB per second
Burst data rate for Fibre Channel drives	100 MB per second	Not applicable
Burst data rate for Low Voltage Differential (LVD) SCSI drives	80 MB per second (Ultra2)	20 MB per second (Fast/Wide)
Burst data rate for High Voltage Differential (HVD) SCSI drives	40 MB per second (Ultra)	20 MB per second (Fast/Wide)
Nominal load-to-ready time	20 seconds	130 seconds (formatted) 135 seconds (unformatted)
Nominal unload time	18 seconds	17 seconds
Average search time to first byte of data	95 seconds	60 seconds

The tape drives provide efficient tape operations and relief to users who have difficulty completing tape activities in the time available. By using their data compression capabilities (which enhance data transfer rates), you can rapidly process tape applications and run tape-related workloads. If you have limited time for system backup or if you have large amounts of disk storage to be backed up, you can use the tape drives to back up your systems quickly and efficiently. If the server files become lost or damaged, the high performance of the tape drives permit fast system recovery.

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 3584 UltraScalable Tape Library is capable of a 7.8-TB/hour rate with Ultrium 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 busses may be required and the 3584 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 197.

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 3584 UltraScalable Tape Library
- Issue the SCSI Initialize Element Status with Range command
- Select the appropriate menus from the 3584 Specialist web interface (see “Performing an Inventory of the Library” on page 91)
- 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 3584 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 5 lists the average move times for the 3584 UltraScalable Tape Library.

Table 5. Average Move Times

Library Configuration	Tape Drive	
	Ultrium Tape Drive	DLT Tape System (see Note)
1 frame	2.5 seconds	6.2 seconds
2 frames	3 seconds	6.7 seconds
4 frames	3.7 seconds	7.4 seconds
6 frames	4.5 seconds	8.2 seconds
Note: The results for DLT Tape Systems 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 6 shows the mount throughput performance for frames that contain LTO Ultrium Tape Cartridges and DLT Tape Cartridges.

Table 6. Mount Throughput Rate

Library Configuration	Mounts Per Hour	
	Ultrium Tape Drive	DLT Tape System
1 frame	550	220
2 frames	500	210
4 frames	390	190
6 frames	320	170

Fetch Rate

Fetch rate is 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 a fetch.

Table 7 shows the fetch rate for LTO Ultrium Tape Cartridges and DLT Tape Cartridges.

Table 7. Fetch Rate

Library Configuration	Fetches/Hour	
	Ultrium Tape Drive	DLT Tape System (see Note)
1 frame	1400	800
2 frames	1200	730
4 frames	970	640
6 frames	800	560
Note: The results for DLT Tape Systems were produced from models, but are consistent with expectations.		

Drive Cleaning

The head of every tape drive in the 3584 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 3584 UltraScalable Tape 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 3584 UltraScalable Tape Library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process. Automatic cleaning makes the cleaning process 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 3584 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 3584 UltraScalable Tape Library. For more information, see "Enabling or Disabling Automatic Cleaning" on page 74.

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 3584 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 76.

IBM recommends that you make sure 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.

To enable automatic cleaning or to perform manual cleaning, see "Cleaning a Tape Drive" on page 74.

TapeAlert Support

The 3584 UltraScalable Tape Library is compatible with TapeAlert technology, which provides to the server error and diagnostic reporting for the drives and the library. For more information, see "Appendix C. TapeAlert Flags" on page 219.

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 3584 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 station. These alerts are called SNMP traps. Using the information supplied in each SNMP trap, the monitoring station (together with customer-supplied software) can alert operations staff of possible problems or operator interventions that occur. Figure 7 shows the flow of SNMP traps over the Ethernet local area network (LAN) to an SNMP monitoring station.

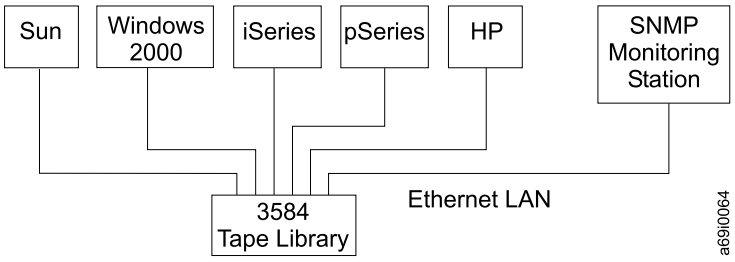


Figure 7. The SNMP Messaging System. The 3584 Tape Library issues SNMP traps to a monitoring station.

Each trap includes the following fields, which enable staff to locate and resolve the problem:

- Machine type
- Model number
- Serial number
- Failing frame number
- Failing drive number
- SCSI sense key
- SCSI additional sense code
- SCSI additional sense code qualifier
- Hardware error code
- Hardware error code qualifier
- Unit reference code
- TapeAlert number
- Text message

Chapter 2. Physical Planning Specifications

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

Physical Specifications

The 3584 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 9 on page 28.

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 3584 UltraScalable Tape Library (on its casters and with jackscrews raised) is 1800 mm (70.9 in.).

Table 8. Physical Characteristics of the 3584 UltraScalable Tape Library

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 3584 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 3584 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 3584 UltraScalable Tape Library from potential movement (for example, from earthquake), restraining points are located at the bottom of the unit (see **1** in Figure 8). Affix restraints to each of the four points (two on each long side) and secure the library as needed.

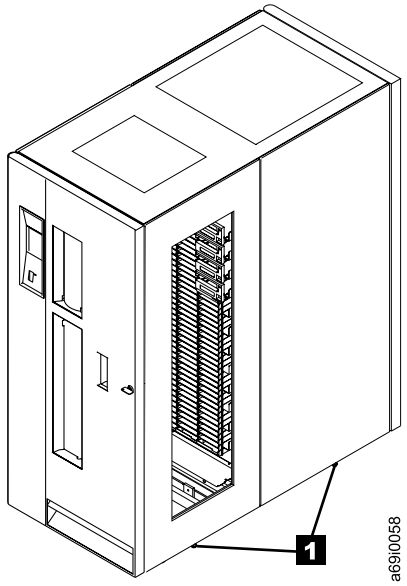


Figure 8. Location of Restraining Points. Two restraining points are located on each long side of the library.

Clearance Specifications

Plan for appropriate clearances around your 3584 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:

- In front of and behind the base frame and expansion frames
- At one or both ends of the library:
  - 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 observe the operation 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 28 shows the length of the library, including side clearances; Figure 9 on page 28 shows the location of the clearances.

Table 9. Clearance Requirements for a 3584 UltraScalable Tape Library that Contains Six Frames

Number of Frames	Length of A in Figure 9
1	2249 mm (88.5 in.)
2	3004 mm (118.3 in.)
3	3759 mm (148.0 in.)
4	4514 mm (177.7 in.)
5	5269 mm (207.4 in.)
6	6024 mm (237.2 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.	

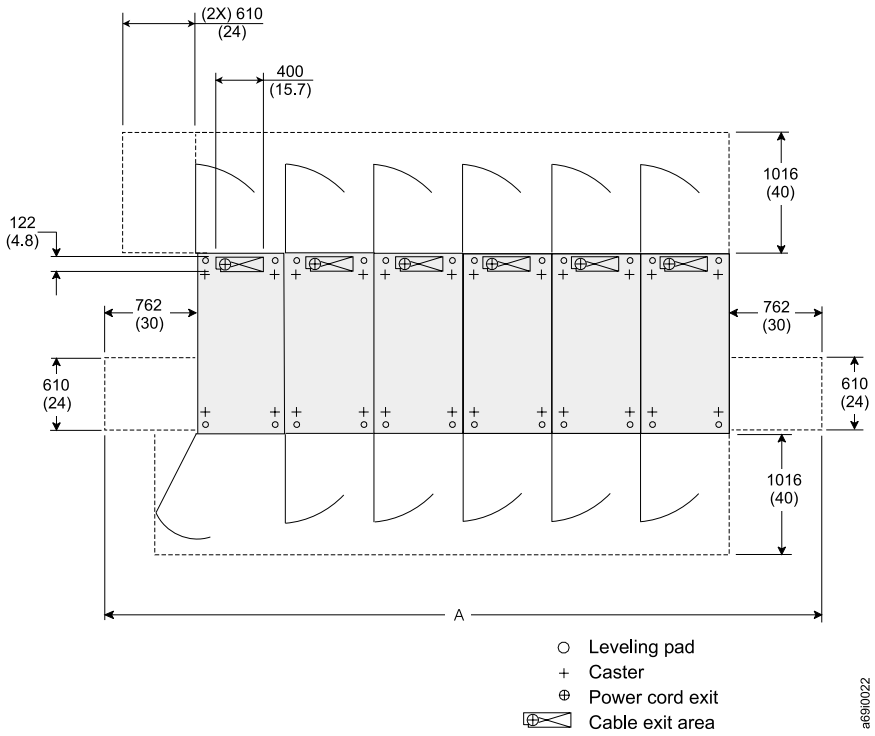


Figure 9. Size of Operator and Service Clearances for the 3584 UltraScalable Tape Library. The top measurements are in millimeters; the bottom measurements are in inches. The service clearance area (and operator clearance area at the front of both frames) is denoted by dotted lines. 2X means that the measurement applies on two sides.

Fire-Suppression Provisions

The 3584 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 10). 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 10) and do not interfere with library components.

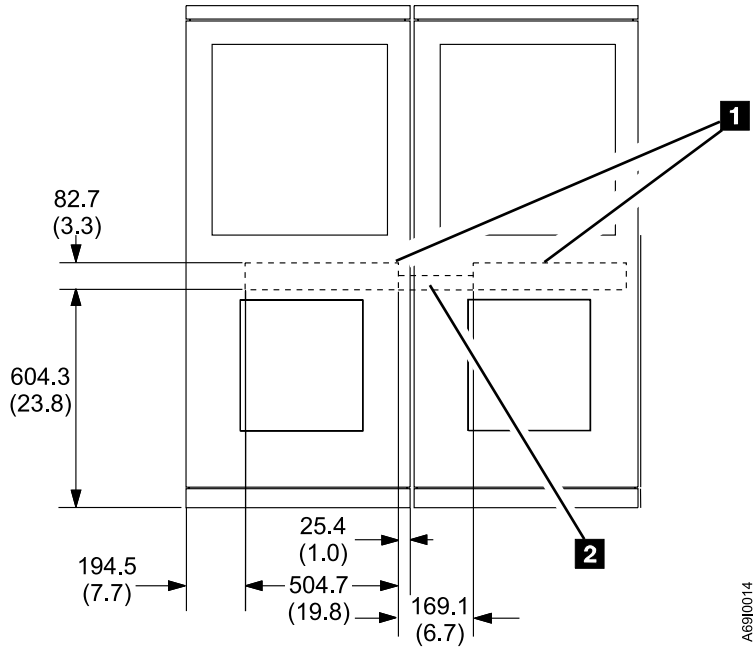


Figure 10. Allowable Area for Mounting Fire-Suppression Equipment (Top View of Frames)

Figure 11 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.

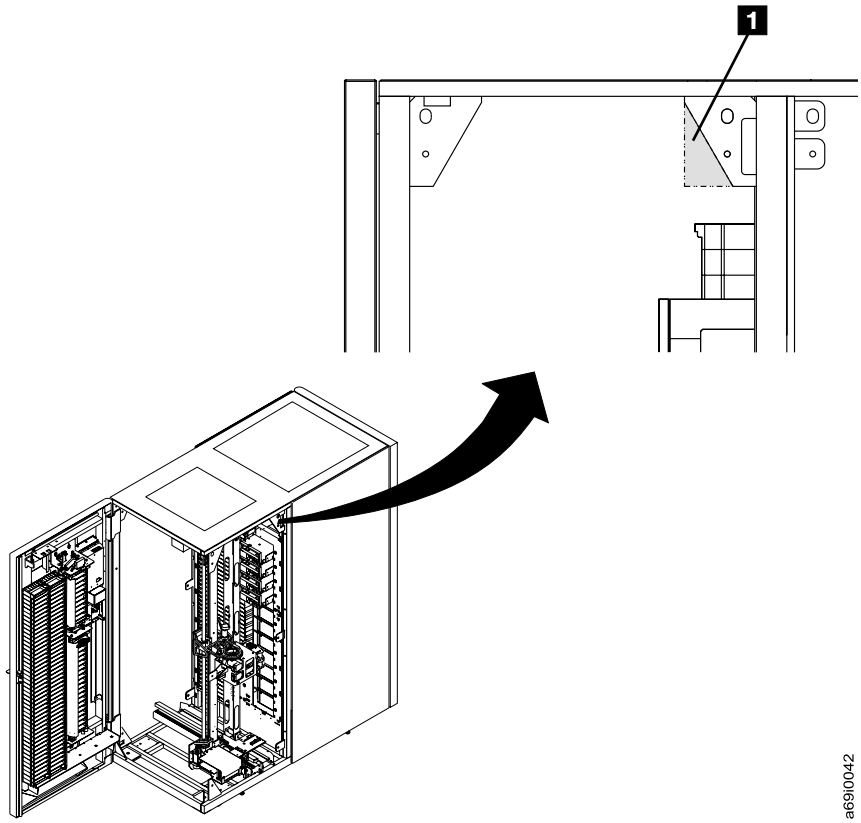


Figure 11. Location for Routing Fire-Suppression Equipment Between Frames

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 173. For frames that contain DLTtape IV Cartridges, see "Environmental and Shipping Specifications for Tape Cartridges" on page 187. Then, adjust the operating environment for the library accordingly.

Table 10. Environmental Specifications for the 3584 UltraScalable Tape Library

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 3584 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 3584 UltraScalable Tape Library is a Category 1 product as defined in C-S 1-1710-006.

Table 11. Noise Emission Values for the 3584 UltraScalable Tape Library

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 3584 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 Vac) power on its own power cord from a customer-supplied outlet. Certain countries require two-phase power to achieve the 200-240 Vac required by the frame.

Table 12 lists the power requirements for the base frame (Model L32) and the expansion frames (Models D32 and D42) in the 3584 UltraScalable Tape Library.

Table 12. Power Requirements for Frames in the 3584 UltraScalable Tape Library

Power Requirement	Models L32, D32, or D42
AC line voltage	200 to 240 Vac (nominal)
Line frequency	50 to 60 Hz
Nominal power	1.4 kW
Line current at 200-240 Vac	8.0 A
kVA	1.6 kVA
Heat output	4.8 kBtu/hr
Inrush current	200 A (peak for 1/2 cycle) @ 200 to 240 Vac

The appropriate power cord for the 3584 UltraScalable Tape Library is attached at the factory (based on your destination country code). 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 34 lists the power cords to use with the 3584 UltraScalable Tape Library (the term "power cord" refers to the cable that connects the library to the receptacle).

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 plug types is as follows:

- Maximum voltage: 250 Vac
- Current: 30 A
- Phases: 1
- Wires: 3

Table 13. Specifications for Power Cords Used With the 3584 UltraScalable Tape Library

Type of Power Cord	Part Number/Feature Code	Type of Receptacle	Type of Connector
4.3 m (14 ft) non-watertight, twistlock (in U.S. and Canada; see **Note**)	11F0113/9987	NEMA style L6-30R	NEMA style L6-30P
4.3 m (14 ft) (in countries other than the U.S. and Canada)	46F6063/None	Per local requirements	Per local requirements
4.3 m (14 ft) watertight (default in the U.S. and Canada)	46F4594/Standard	Russellstoll 9R33UOW	Russellstoll 9C33UO
1.8 m (6 ft) watertight (in Chicago, Illinois, U.S.)	46F4593/9986	Russellstoll 9R33UOW	Russellstoll 9C33UO
Note: Local electrical building codes may require watertight connections for raised-floor installations. For those installations, use IBM part numbers 46F4594 (or 46F4593 in Chicago).			

Chapter 3. Main Components and Basic Operating Procedures

This chapter describes the main components of the 3584 UltraScalable Tape Library (the library's technical components are described in "Appendix B. Technical Components" on page 211). It also gives an overview of the 3584 Tape Library's 3584 Specialist web interface. Following the overview are instructions for using the web or the library's operator panel to perform basic operating procedures.

Main Components

Figure 12 shows the main components of the 3584 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

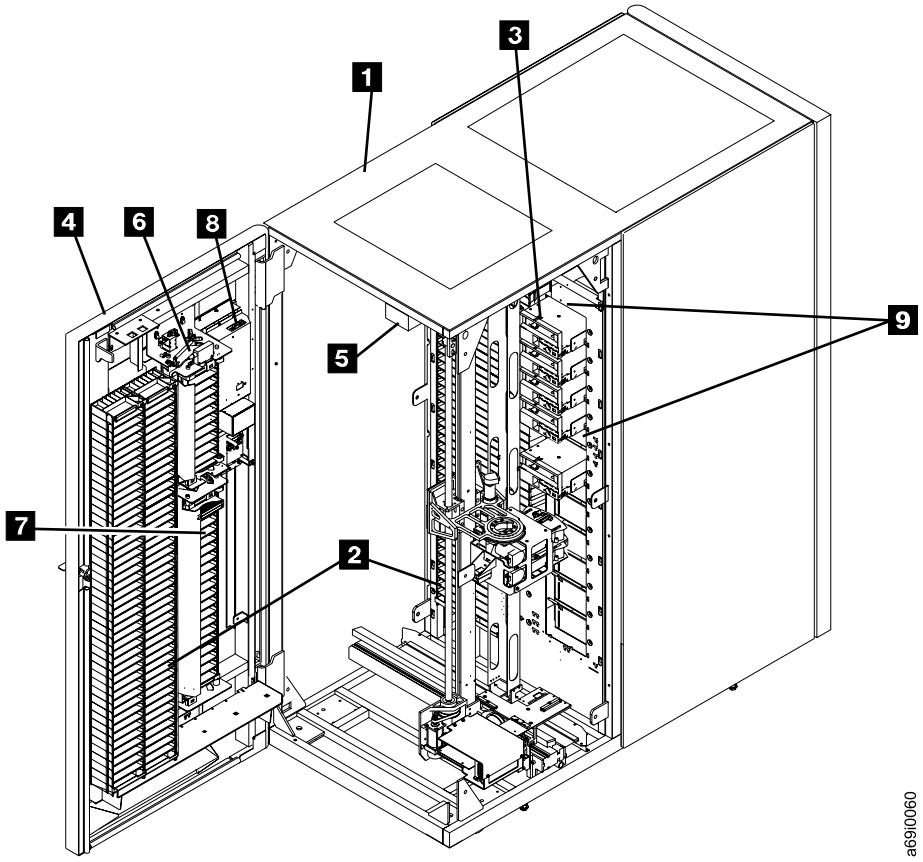


Figure 12. Main Components of the 3584 UltraScalable Tape Library Model L32. The front door is open and the side of the library is cut away to show the components.

Library Frame

The library frame (**1** in Figure 12 on page 35) is the basic building block for the 3584 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 3584 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 11). 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 five 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 12 on page 35) 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 13 on page 38). 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 F2,C03,R22 means:

F2 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.

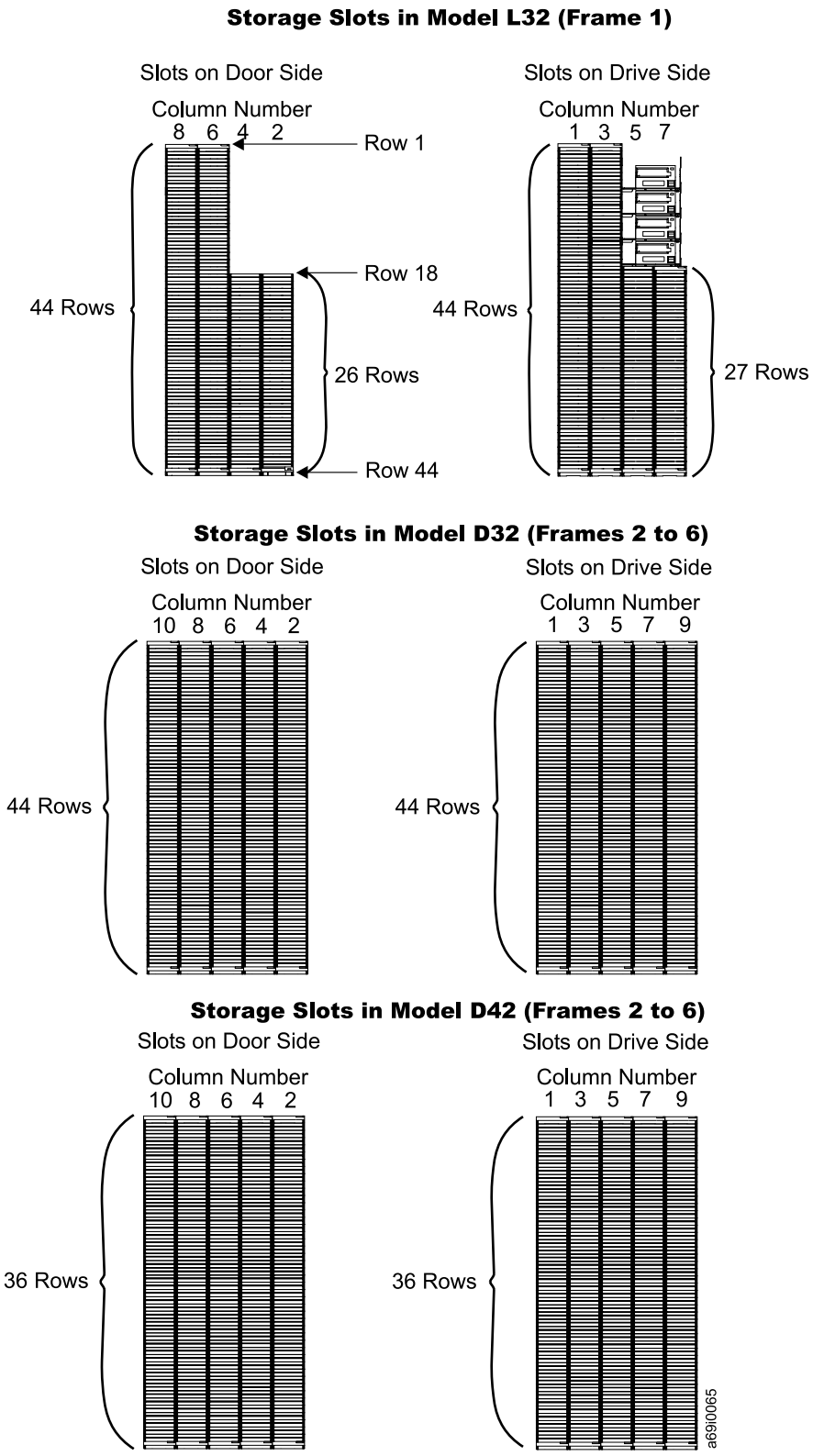


Figure 13. Frame, Column, and Row Numbers. Use this numbering scheme to determine the physical address (location) of each LTO and DLT storage slot. For all possible combinations of storage slots, drives, and I/O slots, see "Appendix D. Locations and Addresses of SCSI Elements" on page 227.

Addressable Cartridge Storage Slots

Addressable storage slots have both a physical address, such as F1,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. Library Capacity.

The 3584 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 236.

Drive or Control Port Rows: Two types of configurations are possible for the drives and the control ports in the 3584 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, if 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.

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 F1,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-addessable cartridge storage slots do not have SCSI element addresses. There are no non-addessable slots in the Model D32 expansion frame.

Tape Drives and Control Ports

Each frame in the 3584 UltraScalable Tape Library can contain one of the following types of tape drives:

- IBM Ultrium 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 213.)

Figure 12 on page 35 shows the location of a tape drive **3** and a control port **9** in the 3584 Tape Library.

Note: The actual control port is visible from the rear of the library.

The sections that follow describe each type of tape drive in the 3584 Tape Library. For information about rear access to the drives or control ports, see “Drive and Power Supply Compartment” on page 215.

Ultrium Tape Drive

The Ultrium Tape Drive writes data to and reads data from IBM LTO Ultrium Data Cartridges. The drive communicates with the server by using one of three types of attachment interfaces: Fibre Channel, LVD Ultra2 SCSI, or HVD Ultra 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 14 shows the Ultrium Tape Drive inside the 3584 Tape Library.

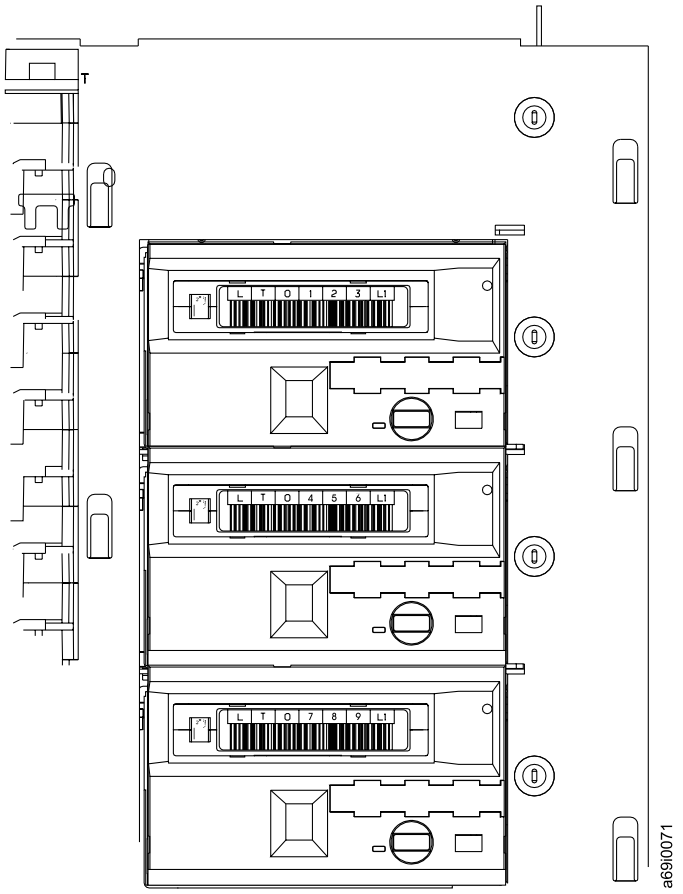


Figure 14. Ultrium Tape Drive. Three drives are shown inside the library and are loaded with LTO Ultrium Tape Cartridges.

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 Drive, each DLT 8000 Tape System in a Model D42 frame requires a hardware unit called a control port. Although the Ultrium Tape Drive can communicate directly with servers, the DLT Tape System must use the control port for server communication. 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 15 shows the DLT 8000 Tape System inside the 3584 Tape Library.

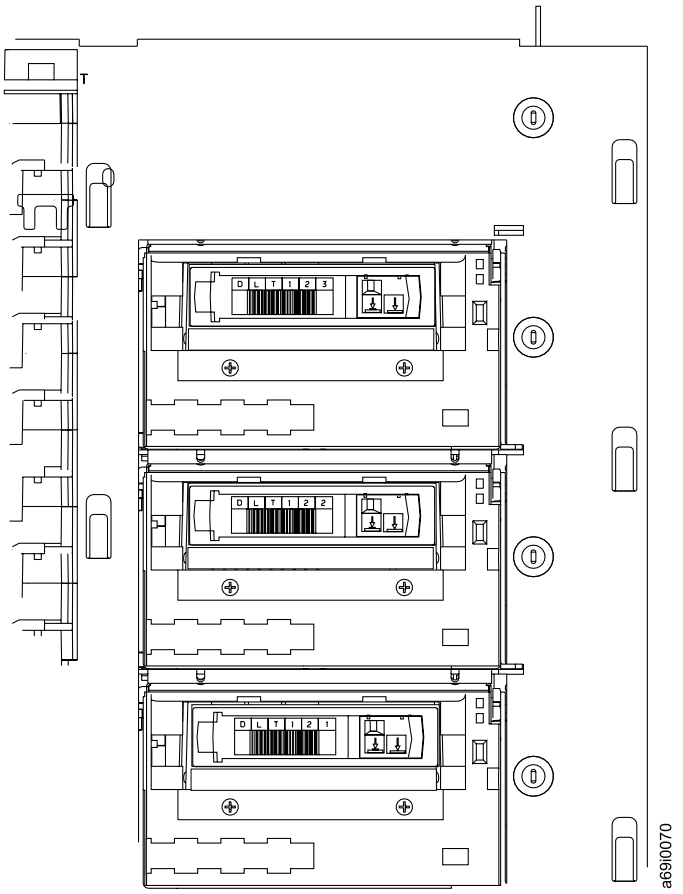


Figure 15. DLT 8000 Tape System. Three drives are shown inside the library and are loaded with DLTtape IV Tape Cartridges.

Physical Address

The 3584 UltraScalable Tape Library assigns each tape drive or control port a unique address to indicate its physical location. 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 F2,R10 means frame 2 (the first expansion frame), row 10.

Doors

Located at the front of each frame is the front door (see Figure 12 on page 35). 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 16) 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°.
Each frame of the 3584 UltraScalable Tape Library also includes a rear door with a

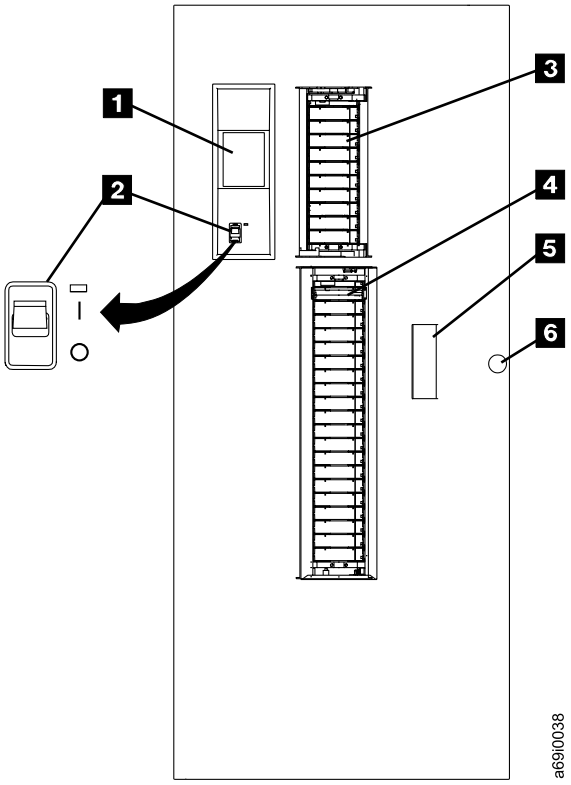


Figure 16. Front Door. The operator panel is mounted on the front door of the base frame (Model L32). The doors of both I/O stations are in an opened position.

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 3584 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 12 on page 35) 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 3584 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 61 and “Removing Cartridges from the Library” on page 65.

The I/O stations (**6** in Figure 12 on page 35) let you insert or remove cartridges while the 3584 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 one media type (LTO Ultrium tape cartridges), you can order a second, 20-cartridge LTO I/O station.
- In a library that supports mixed media (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 26 on page 62). 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 F1,R05 means frame 1, row 5 (fifth row from the top of the upper I/O station; see 1 in Figure 17). An I/O slot address of F1,R13 means frame 1, row 13 (third row 2 in the lower I/O station).

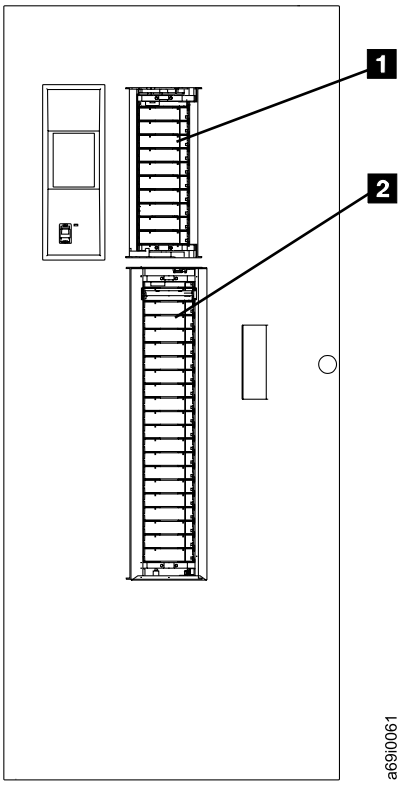


Figure 17. Storage Slot Addresses in the I/O Stations

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 12 on page 35) 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 18):

1 Library power switch
A toggle switch that lets you power the 3584 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 59.

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 143.

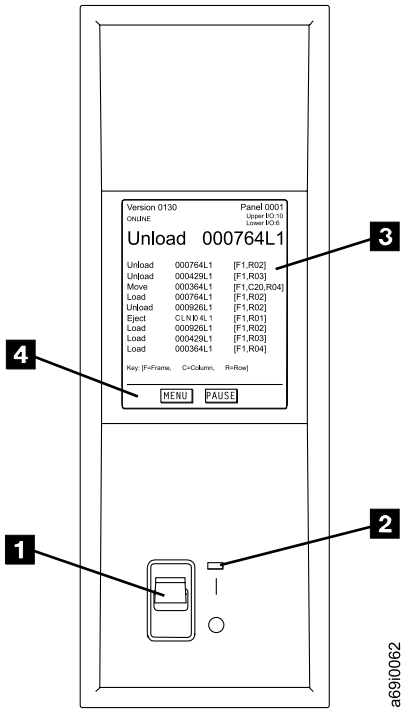


Figure 18. Operator Panel on the 3584 UltraScalable Tape Library

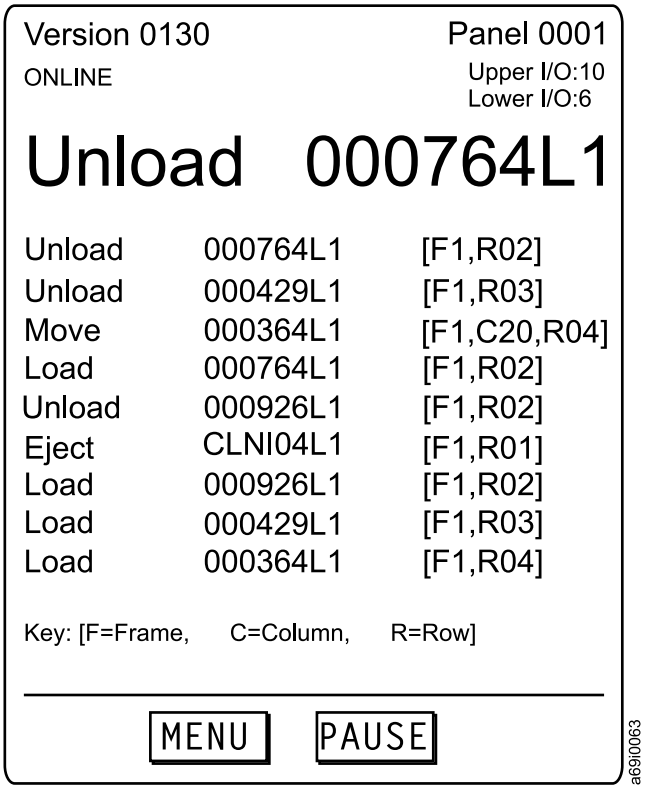


Figure 19. Activity Screen on the 3584 UltraScalable Tape Library

Activity Screen

The Activity screen (see Figure 19) displays on the touchscreen LCD when the library is online (that is, when the host applications are interacting 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 online, offline (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 19, a cartridge with a volume serial number (VOLSER) and media-type identifier of 000764L1 was unloaded from the drive in frame 1, row 2).

The information in the Activity screen is automatically replaced by an error message when the 3584 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.

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

PAUSE Key

The 3584 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.

Basic Operating Procedures

Table 14 lists the operating procedures that you can perform with the 3584 UltraScalable Tape Library. The basic operating procedures are described in this chapter. The advanced operating procedures are described in “Chapter 4. Advanced Operating Procedures” on page 79.

For an overview of the library’s menu functions, see “Functions of the Library’s Operator Panel” on page 52. For an overview of the library’s web functions, see “Functions of the Library’s 3584 Specialist Web Interface” on page 54.

Table 14. Operating Procedures for the 3584 UltraScalable Tape Library

If You Want To Do This...	Go To Page....
Turn on the power to the library	58
Turn off the power to the library	59
Insert a data or scratch cartridge into the library	60
Remove a cartridge from the library	65
Insert a cleaning cartridge into the library	68
Remove a cleaning cartridge from the library	72
Enable or disable automatic cleaning of a tape drive	74
Manually clean a tape drive	76
Initialize the tape cartridge’s volume serial number	78
Determine the status of the cartridge accessor	80
Determine the status of a control port	84
Determine the status of a tape drive	82
Determine the status of the I/O stations	85
Determine the status of any storage slot	87
Determine the location of any cartridge	89
Perform an inventory of the library or a frame	91
Move a specific tape cartridge	95
Display the configuration of the library	101
Configure the library without partitions	104
Configure the library with partitions	108
Display the SCSI ID or Loop ID (AL_PA) of a tape drive or control port	122
Change the SCSI ID or Loop ID (AL_PA) of a tape drive or control port	124
Display the World Wide Port Name of a Fibre Channel tape drive	127
Display the World Wide Node Name of a Fibre Channel tape drive	129
Display control paths	131
Change control paths	133
Select network settings	135
Change the date and time on the LCD	141
Enable or disable the beep	143
Determine the usage of the cartridge accessor	144
Determine the usage of the tape drives	146
Determine the usage of the cleaning cartridge	148

Table 14. Operating Procedures for the 3584 UltraScalable Tape Library (continued)

If You Want To Do This...	Go To Page....
Access vital product data (VPD) for the library	150
Access VPD for the Ultrium Tape Drives	152
Access VPD for the node cards	154
Access VPD for the control ports	156
Update library firmware	157
Update drive firmware	158

Functions of the Library's Operator Panel

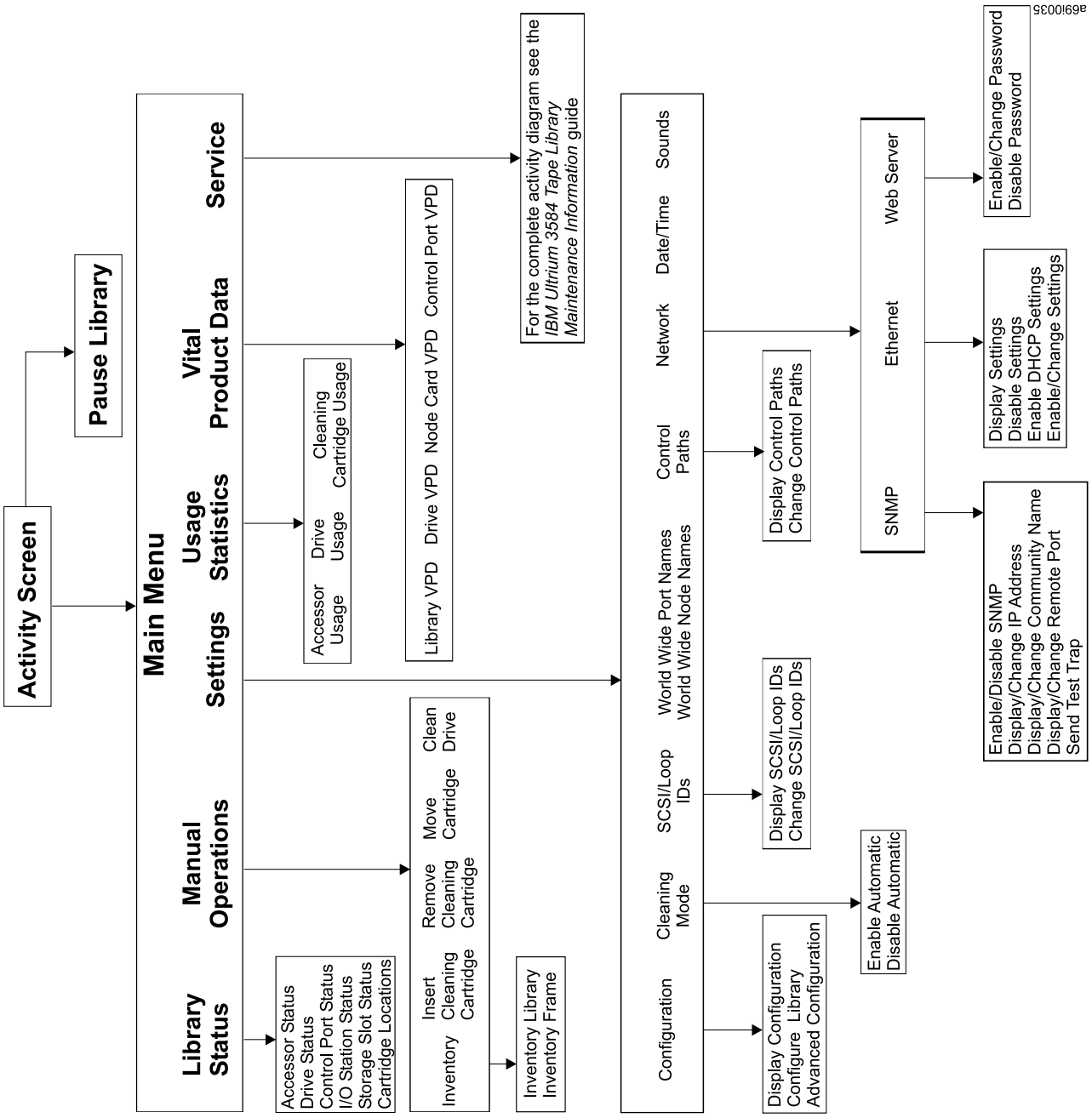


Figure 20. Functions of the 3584 UltraScalable Tape Library's Operator Panel

Operating the Library from the Web

If you choose to operate the 3584 UltraScalable Tape Library by using a web browser rather than the library's operator panel, read this section. The 3584 Tape Library features the 3584 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 "Selecting the Network Settings" on page 135.
2. Access Internet Explorer 5.0 (or higher) or Netscape Navigator 4.7 (or higher).
3. Type the Ethernet IP address on the URL line of the browser and press Enter.

The Introduction screen of the 3584 Specialist web interface displays (see Figure 21). The screen lets you access library functions and provides information about using Help. It also offers a Getting Started link that gives an introduction to the interface and includes a Reference Information link that describes the library.

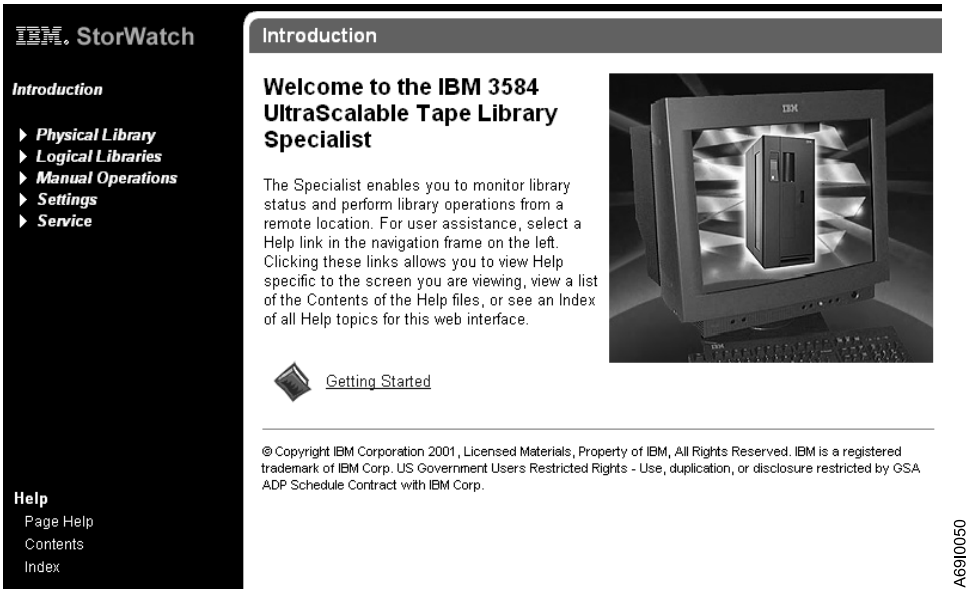


Figure 21. Introduction Screen in the 3584 Specialist Web Interface

Functions of the Library's 3584 Specialist Web Interface

The 3584 Specialist interface lets you perform many library functions from the web. Figure 22 shows a flowchart of the functions that are available.

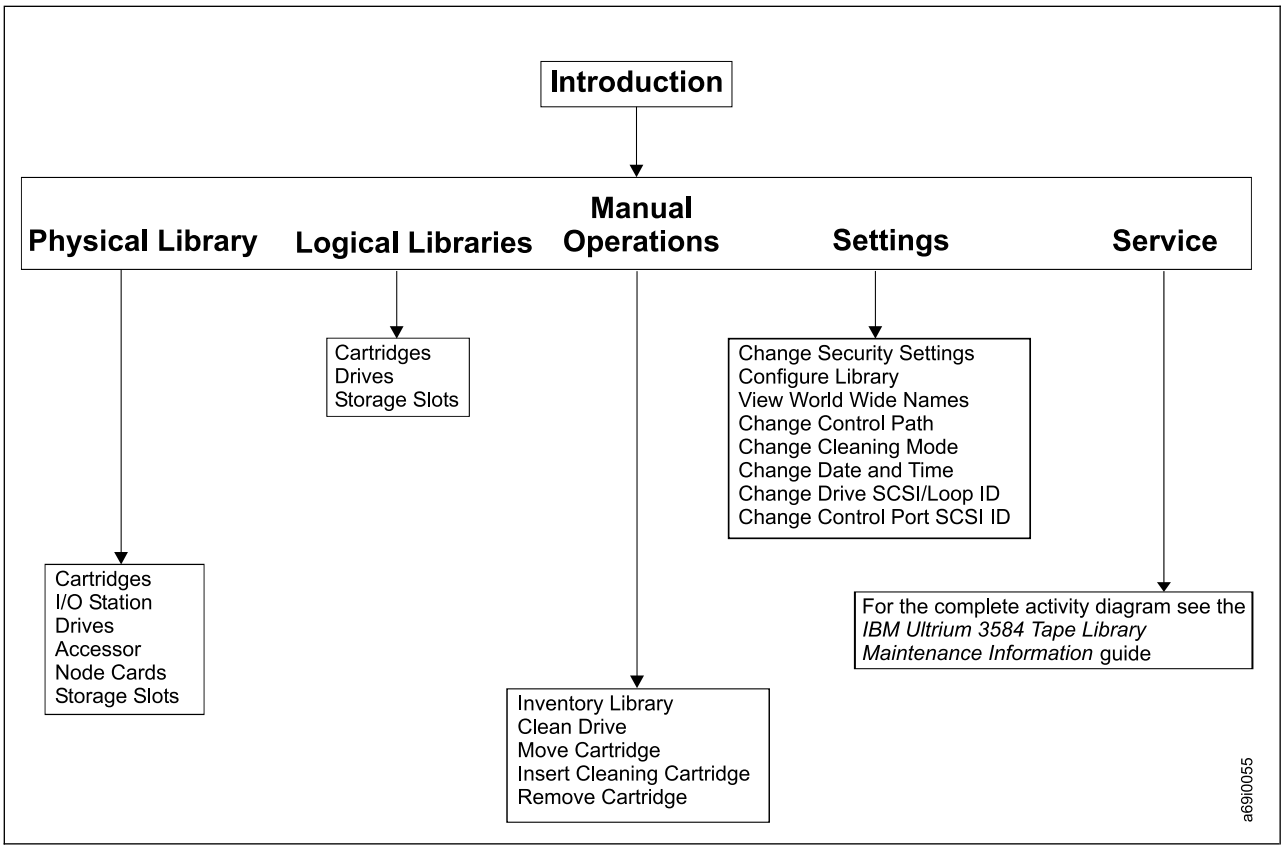


Figure 22. Functions of the 3584 UltraScalable Tape Library's 3584 Specialist Web Interface

Navigating Through the 3584 Specialist Web Interface

Navigation through the 3584 Specialist interface is easy. Figure 23 shows the elements and navigational aids in a typical screen.

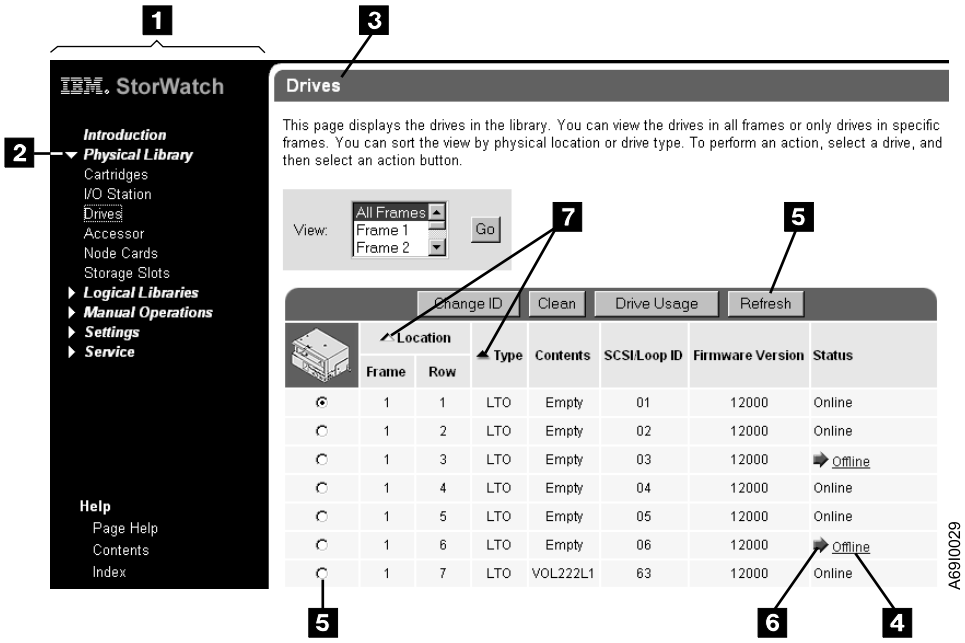


Figure 23. Elements in a Typical 3584 Specialist Web Screen

1 Navigation area

A selection of functions that you can perform. When you click a function, sub-functions display. Also located in this area is comprehensive Help navigation. Click a Help subtopic for the following type of help:

- *Page Help* - provides specific assistance for the screen that you are currently in.
- *Contents* - displays a table of contents and an index.
- *Index* - gives an index of all Help topics.

2 Twisty

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

3 Screen title

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

4 Link

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

5 Buttons

Screen entities that indicate selection. Radio buttons (the round buttons) signify objects; select buttons (the 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, click the round button beside that drive, then click the Drive Usage button to begin the procedure. You cannot select multiple radio buttons.

6 Error indicators

Right arrows that indicate a problem with an item. A red arrow indicates that immediate action is required (or the function cannot continue). A yellow arrow indicates that action is required, but is not urgent. Click the hyperlinked text to the left of the arrow to display an error or informational message.

7 Sort indicators

A filled (raised) triangle indicates that the field can be sorted. An empty (depressed) triangle indicates that the field has been sorted.

Security

Certain library functions can be restricted to authorized users through password protection. The administrator user password is disabled when IBM ships the library from the factory. To enable an administrator user password, see the instructions on page 140.

After you enable the password, the following functions are password-protected:

- Enable or disable control paths
- Change drive SCSI or Loop IDs
- Clean a drive
- Configure logical libraries
- Move cartridges
- Remove cartridges
- Import data or scratch cartridges (importing cleaning cartridges is not password-protected)
- Inventory the library
- Change the cleaning mode
- Update library and drive firmware
- Update control port firmware
- Download logs
- Change date and time
- Change the 3584 Specialist web interface password
- Change control port SCSI IDs

Using the 3584 Specialist Interface

After you connect to the 3584 Specialist web interface and display the Introduction screen, click Physical Library. The Physical Library screen displays the library's main components and physical configuration (see Figure 24). To get information about each main component, click it in the navigation area, click on the numbers on the graphic, or click on the links in the Physical Configuration table.

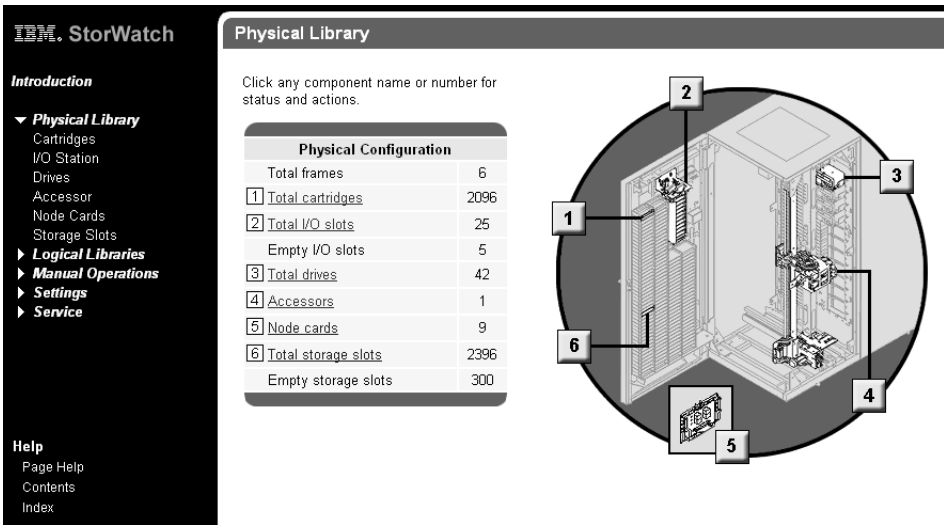


Figure 24. Physical Library Screen

Powering-On the Library

Use the following steps to power-on the 3584 UltraScalable Tape Library:

1. Review the information about the library power switch and power-on indicator in “Operator Panel” on page 47.
2. While watching for the green power-on indicator to turn on and stay on (see **1** in Figure 25), 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 3584 UltraScalable Tape 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 **ONLINE** displays on the Activity screen.

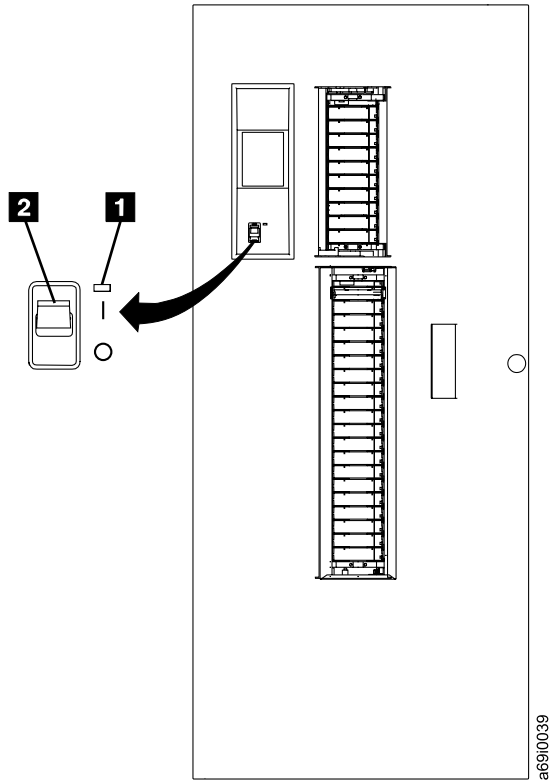


Figure 25. Powering-On the 3584 UltraScalable Tape Library. The library power switch and the power-on indicator are located on the operator panel of the base frame (Model L32).

Powering-Off the Library

Note: If you must power-off the library due to an emergency, move the power switch to 0.

Use the following steps to power-off the 3584 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 off-line 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 25 on page 58). If you do not power-off within 30 seconds, the Activity screen displays again.

Inserting Cartridges into the Library

After you install the 3584 UltraScalable Tape Library, you can insert cartridges into it. The following types of cartridges may 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 may 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 may use other LTO- or DLT-certified media, but they may not meet the standards of reliability established by IBM. If you are using mixed media, 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 68 and "Removing a Cleaning Cartridge from the Library" on page 72.

Diagnostic cartridge
A tape cartridge that is used by the IBM Service Representative to service the 3584 UltraScalable Tape Library. The service representative installs the cartridge at the same time that the library is installed. For mixed media libraries, the service representative installs a diagnostic cartridge for each type of media.

The quantity of cartridges that you can add to the 3584 UltraScalable Tape Library is equal to the maximum number of available storage slots (see "Appendix A. Library Capacity" on page 209). Before you insert data or scratch cartridges, make sure that there are enough available slots (see "Storage Slot Status" on page 87).

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 media, place LTO Ultrium Tape Cartridges into black slots and DLT Tape Cartridges into gray slots). Because this method takes the 3584 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 3584 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 26 on page 62):
   - 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.
3. Repeat step 2 for each cartridge that you want to insert.
4. 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. Repeat step 2.
5. 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.
6. 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 95.

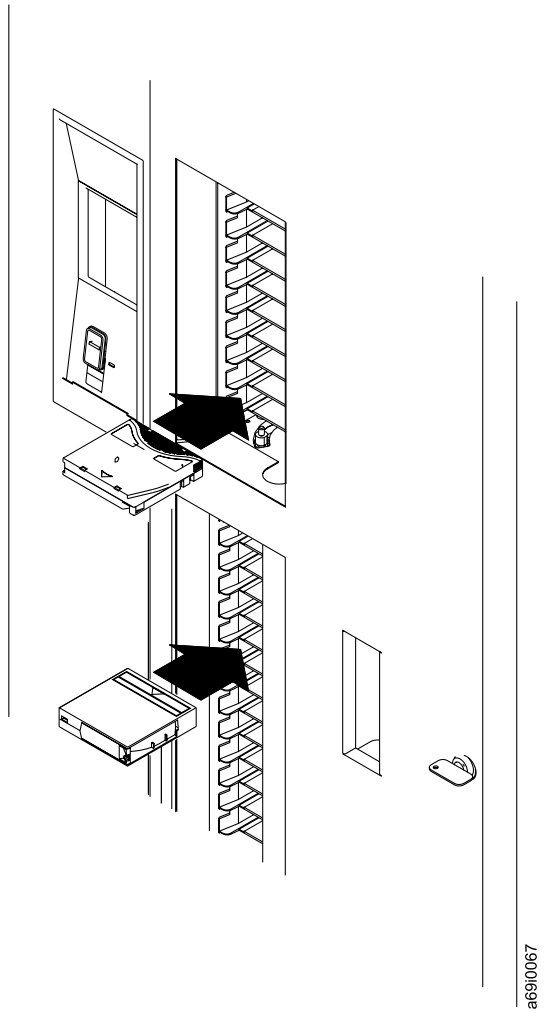


Figure 26. Using an I/O Station to Insert Cartridges. The cartridge's orientation differs from its orientation in a cartridge storage slot. After you insert the cartridges, use the host application software to move the cartridges to the library's storage slots or drives. The figure shows a library that uses mixed media.

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 101). 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 27), press the PAUSE key. The library displays the message **If you open the door the library will go off-line and any remaining jobs in the work queue may fail. Press ENTER to continue.**

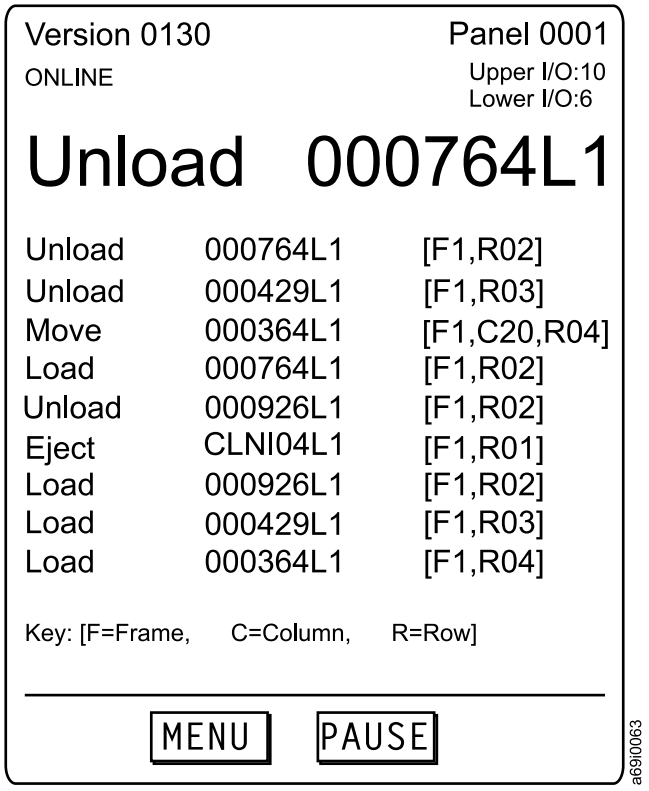


Figure 27. Activity Screen on the Front Panel of the 3584 UltraScalable Tape Library. Use the screen to bulk load tape cartridges.

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, F1,C01,R01 for LTO Ultrium Tape Cartridges; or, if you are using mixed media, 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 108), insert the cartridges into the appropriate logical library.
   - 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 28).

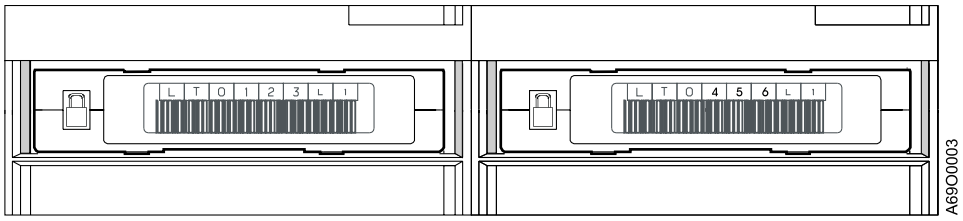


Figure 28. Proper Orientation of the LTO Ultrium Tape Cartridge in a Cartridge Storage Slot. The write-protect switch is on the left and the VOLSER label is visible. The orientation differs from the orientation in an I/O slot.

   - 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 29).

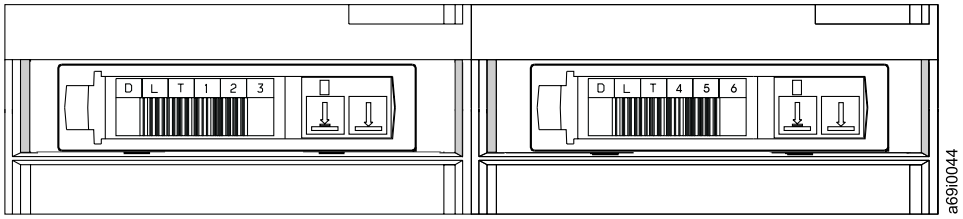


Figure 29. Proper Orientation of the DLTtape IV Tape Cartridge in a Cartridge Storage Slot. The write-protect switch is on the right and the VOLSER label is visible. The orientation differs from the orientation in an I/O slot.

6. Gently close and lock the front door.
7. After approximately 15 seconds, the 3584 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, **ONLINE** displays.

Removing Cartridges from the Library

To remove a cartridge from the 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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. Click Manual Operations | Remove Cartridge. The Cartridges screen displays.
3. Follow the instructions on the screen to specify the cartridge that you want to remove.
4. Follow the instructions on the screen to remove the cartridge to a physical location (an I/O slot).
5. Open the door of the I/O station and remove the cartridge.

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 95).

     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 Cartridge from a Drive

In a rare situation, you may want to remove a 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 27 on page 63), press the PAUSE key. The library displays the message **If you open the door the library will go off-line 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.
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 30). Remove the cartridge.

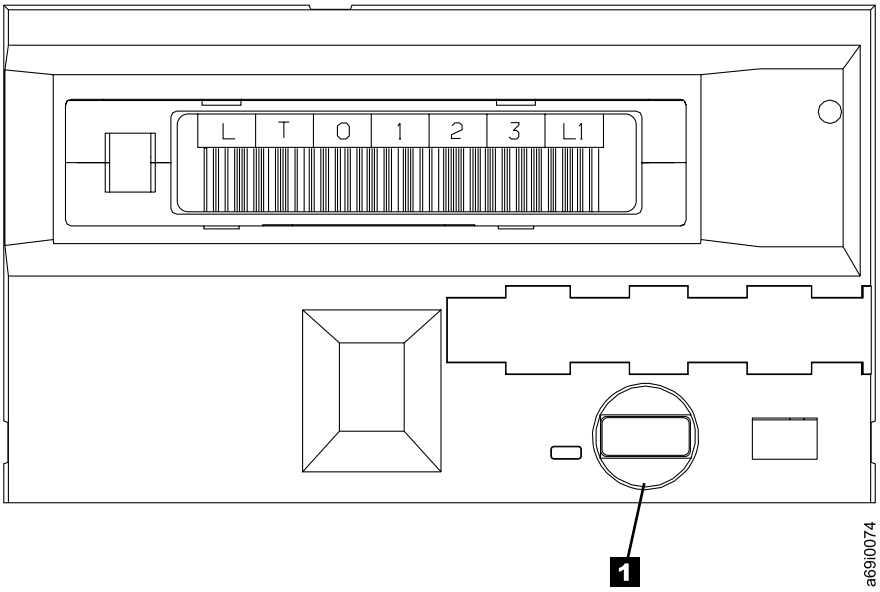


Figure 30. Removing a Cartridge from an Ultrium Tape Drive

- For the DLT Tape System, perform one of the following procedures:
  - If the green Operate Handle light (see **1** in Figure 31) 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 cartridge protruding from the drive or it will interfere with the operation of the gripper.

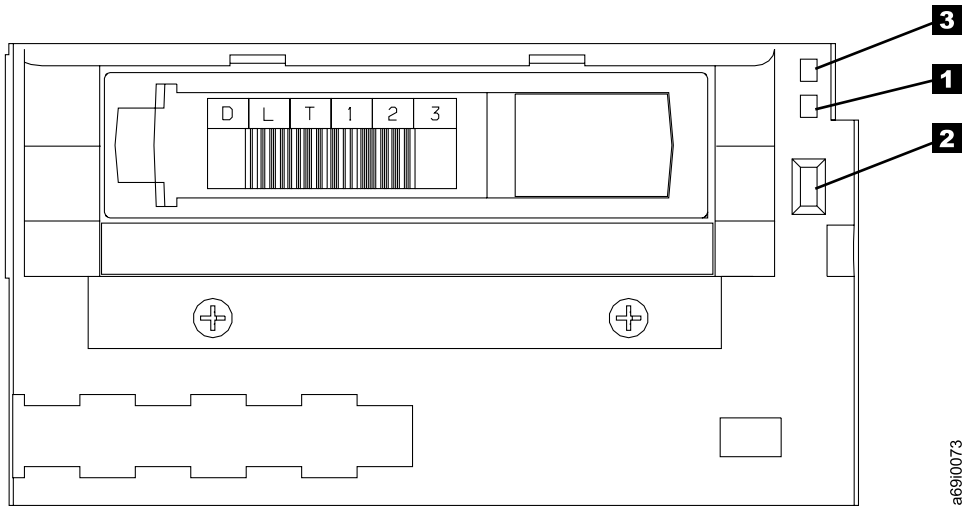


Figure 31. Removing a Cartridge from a DLT Tape System

5. Gently close and lock the front door.
6. After approximately 15 seconds, the 3584 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, **ONLINE** displays.

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 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 3584 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 3584 UltraScalable Tape Library when automatic cleaning is enabled, use one of the following methods.

From the Web: To use the library's 3584 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 26 on page 62):
   - 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. Click Manual Operations | Insert Cleaning Cartridge. The Insert Cleaning Cartridge screen displays.
6. Follow the instructions on the screen.

From the Operator Panel: Use the following steps to insert a cleaning cartridge into the 3584 UltraScalable Tape Library when automatic cleaning is enabled:

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 Insert Cleaning Cartridge, then press ENTER.
4. The library displays the message **Insert Cleaning Cartridge 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 26 on page 62):
   - 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.
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. 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.

Inserting a Cleaning Cartridge with Automatic Cleaning Disabled

To insert a cleaning cartridge into the 3584 UltraScalable Tape Library when automatic cleaning is disabled:

From the Web: To use the library's 3584 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 26 on page 62):
   - 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. Click Manual Operations | Insert Cleaning Cartridge. The Insert Cleaning Cartridge screen displays.
6. Follow the instructions on the screen.

From the Operator Panel: Use the following steps to insert a cleaning cartridge into the 3584 UltraScalable Tape Library when automatic cleaning is disabled:

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 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

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

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

4. Open the door of the I/O station that you want to use and insert a cartridge as follows (see Figure 26 on page 62):
   - 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 you placed an LTO Ultrium Tape Cartridge into a DLT I/O slot (or a DLT Tape Cartridge into an LTO I/O slot), the library displays the message **Unable to insert cleaning cartridge, logical library selected is incorrect media type**.
5. Repeat step 4 for each cartridge that you want to insert.
6. Close the door of the I/O station.
7. 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**.
8. Press ENTER to return to the Manual Operations menu.
9. Press BACK until you return to the Activity screen.

Removing a Cleaning Cartridge from the Library

To remove a cleaning cartridge from the 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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. Click Physical Library | Cartridges. The Cartridges screen displays.
3. Click the Display all cleaning cartridges link. The Cleaning Cartridges screen displays.
4. Follow the instructions on the screen to move the cleaning cartridge to a slot in the I/O station.
5. Open the door of the I/O station and remove the cleaning cartridge.

From the Operator Panel

Use the following steps to remove a cleaning cartridge from the 3584 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 ]  [DOWN]  [ENTER]
```

3. Press UP or DOWN to highlight Remove Cleaning Cartridge, then press ENTER. The Cleaning Cartridge Usage 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.

```
Cleaning Cartridge Usage        Panel 0220

CLN01:      020     DLT
CLNI02L1:   020     LTO
CLNI03L1:   015     LTO
CLNI04L1:   010     LTO
CLN05:      005     DLT
CLN06:      000     DLT
CLNI07L1:   000     LTO
CLN08:      000     DLT
CLN09:      000     DLT
CLNI10L1:   000     LTO

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

4. When you access the screen that contains the cleaning cartridge that you want, press ENTER.
5. 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 I/O station is full. Please remove cartridges to allow Cleaning Cartridge Removal, then restart this operation**. Open the door of the I/O station and remove one or more cartridges, then press ENTER to resume the operation.
6. Press ENTER to return to the Manual Operations menu.
7. Press BACK until you return to the Activity screen.
8. Open the door of the I/O station and remove the cleaning cartridge.

Cleaning a Tape Drive

Enabling or Disabling Automatic Cleaning

Automatic cleaning enables the 3584 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 3584 UltraScalable Tape Library.

IBM recommends that automatic cleaning always be enabled for the 3584 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 physical location of the drive by the message **CLEAN [Fx,Rzz]** (where F equals the frame and x equals its number, and where R equals the row and zz equals its number). 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 3584 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 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 68).
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

[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.

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 82.

IBM does not recommend that you clean a drive on a periodic basis; the library detects when a drive needs cleaning and 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. Ensure that a cleaning cartridge is loaded in the library (see “Inserting a Cleaning Cartridge into the Library” on page 68).
2. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.
3. Click Manual Operations | Clean Drive. The Drives screen displays all of the drives in the library.
4. Follow the instructions on the screen.

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 68).
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 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).

```
Select Drive       Panel 0028

Key: [F=Frame, R=Row]

257    101h    Drive [F1,R01]
258    102h    Drive [F1,R02]
259    103h    Drive [F1,R03]
260    104h    Drive [F1,R04]
261    105h    Drive [F1,R05]
262    106h    Drive [F1,R06]
263    107h    Drive [F1,R07]
264    108h    Drive [F1,R08]
265    109h    Drive [F1,R09]
266    10Ah    Drive [F1,R10]

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

5. 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 68.

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

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 164; for DLT Tape Cartridges, see "Bar Code Label" on page 180).
2. Insert the cartridges into the library (see "Inserting Cartridges into the Library" on page 60).
3. Use your software application to write the bar code VOLSER to the tape (for more information, see the documentation for your software application).

Chapter 4. Advanced Operating Procedures

This chapter gives instructions for using the web or the library's operator panel to perform advanced functions. The functions include how to:

- Determine whether the library's main components are operating properly and where any tape cartridges are located
- Manually perform an inventory of the library and any frame
- Move a tape cartridge
- Display the physical and logical configuration of one or more existing libraries
- Configure one logical library
- Configure two or more logical libraries (by using labels or menus)
- Display or change the SCSI ID of one or more SCSI tape drives or control ports
- Display or change the Loop ID of one or more Fibre Channel tape drives
- Display the World Wide Port Name of one or more Fibre Channel tape drives
- Display the World Wide Node Name of one or more Fibre Channel tape drives
- Display or change control paths
- Display or change network settings
- Change the date and time on the display
- Enable or disable the beep
- Determine usage data for the cartridge accessor, tape drive, and cleaning cartridge
- Access vital product data (VPD) about the library, tape drive, node cards, and control ports
- Update firmware for the library, drives, and control ports.

To view a flow chart of the functions that you can perform by using the library's operator panel, see "Functions of the Library's Operator Panel" on page 52. To view a similar chart of the functions that you can perform by using the web, see "Functions of the Library's 3584 Specialist Web Interface" on page 54.

Determining Library Status

This section describes how to determine the status of the 3584 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 3584 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. Click 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]  [ UP ]  [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 Accessor Status and press ENTER. The Accessor Status screen displays.

```
Accessor Status              Panel 0004

  Accessor 1 - 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` followed by 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.

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 3584 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. Click Physical Library | Drives or click Logical Library | Drives. 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]  [ UP ]  [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

  Frame 1 Media type: LTO

    Drive 1   Online   VOL110L1
    Drive 2   FAILED   Empty
    Drive 3   Online   Empty
    Drive 4   Online   VOL111L1
    Drive 5   Offline  Empty
    Drive 6   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 indicates whether each is functioning properly (`Online`), is offline for service (`Offline`), is not communicating with the library (`CommFail`), or is communicating with the library but has a problem (`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`.

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

Control Port Status

From the Web

To use the library's 3584 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. Click Settings | Change Control Port ID. 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]  [ UP ]  [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

    Control Port 0   Online
    Control Port 2   CommFail
    Control Port 3   Online

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

   The first time that this screen displays, it shows Frame 2, Ports 1 - x, where 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).
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 3584 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. Click 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]  [ UP ]  [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]
```

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 3584 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. Click Physical Library | Storage Slots or click Logical Library | Storage Slots. 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, click 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]  [ UP ]  [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
     Cleaning:                0        0
  Empty Slots:              155      305
  Total Capacity:           175      346

Frame 1 Totals
  Cartridges
     Data:                   20        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

[F1,C01,R01]     VOL011L1
[F1,C01,R02]     VOL012L1
[F1,C01,R03]     VOL013L1
[F1,C01,R04]     VOL014L1
[F1,C01,R05]     CLNI01L1
[F1,C01,R06]     VOL015L1
[F1,C01,R07]     VOL016L1
[F1,C01,R08]     VOL017L1
[F1,C01,R09]     VOL018L1
[F1,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.

From the Web

To use the library's 3584 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. Click Physical Library | Cartridges or click Logical Library | Cartridges. The Cartridges screen displays. You can make selections to view the cartridges in the entire library or in a specific frame. You can also view the cartridges by VOLSER, physical location, or SCSI element address.

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 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 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]  [ UP ]  [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   [F1,C03,R01]
VOL002L1   Drive  [F2,R03]
VOL003L1   I/O    [F1,R03]
VOL004L1   Slot   [F1,C03,R01]
VOL005L1   Slot   [F1,C03,R02]
VOL006L1   Slot   [F1,C03,R03]
VOL007L1   Slot   [F1,C03,R04]
VOL008L1   Slot   [F1,C03,R05]
VOL009L1   Slot   [F1,C03,R06]
VOL010L1   Slot   [F1,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 3584 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. Click Manual Operations | Inventory Library. The Inventory Library screen displays with options for performing an inventory on the entire library or a specific frame.
3. Click Entire Library, 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]  [ UP ]  [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 Manual Operations menu.
7. Press BACK until you return to the Activity screen.

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 3584 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. Click Manual Operations | Inventory Library. The Inventory Library screen displays with options for performing an inventory on the entire library or a specific frame.
3. Click the number of 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]  [ UP ]  [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 ]  [DOWN]  [ENTER]
```

4. Press UP or DOWN to highlight Inventory Frame, then press ENTER. The Frame Selection screen displays.

```
Frame Selection        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 Frame Selection screen shows the type of media used in the frame that you selected. When the desired frame number displays, 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 updated. Press ENTER to continue.**
6. 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 Manual Operations menu.
8. Press BACK until you return to the Activity screen.

Moving a Cartridge

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 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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. Click Manual Operations | Move Cartridge. The 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 a list of LTO cartridges in the library, identified by their VOLSERs and their physical 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). To display more cartridges, press DOWN; to return to cartridges that you have viewed, press UP. When you access the screen that contains the VOLSER that you want, press ENTER. Then, press UP or DOWN to highlight that VOLSER and press ENTER.

```
Select Source Volume        Panel 0022

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

VOL011L1    Slot   [F1,C03,R01]
VOL012L1    Drive  [F2,R03]
VOL013L1    I/O    [F1,R03]
VOL014L1    Slot   [F1,C03,R01]
VOL015L1    Slot   [F1,C03,R02]
VOL016L1    Slot   [F1,C03,R03]
VOL017L1    Slot   [F1,C03,R04]
VOL018L1    Slot   [F1,C03,R05]
VOL019L1    Slot   [F1,C03,R06]
VOL020L1    Slot   [F1,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 a list of LTO cartridges in the library, identified by their SCSI element addresses (in both decimal and hexadecimal format) and their VOLSERs. To display more cartridges, press DOWN; to return to cartridges that you have viewed, press UP. When you access the screen that contains the SCSI element address that you want, press ENTER. Then, press UP or DOWN to highlight that element address 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 a list of LTO cartridges in the library, identified by their physical frame, column, or row location and their VOLSERs. 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). To display more locations, press DOWN; to return to locations that you have viewed, press UP. When you access the screen that contains the location that you want, press ENTER. Then, press UP or DOWN to highlight that location and press ENTER.

```
Select Source Location         Panel 0024

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

Media Type: LTO

Drive  [F2,R12]      VOL003L1
I/O    [F1,R01]      VOL004L1
Slot   [F1,C01,R01]  VOL005L1
Slot   [F1,C01,R02]  VOL006L1
Slot   [F1,C02,R01]  VOL007L1
Slot   [F2,C01,R02]  CLNI01L1
Slot   [F2,C01,R03]  CLNI02L1
Slot   [F2,C01,R04]  VOL008L1

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

The library locates the cartridge to be moved and displays the Select Destination screen. You can specify the library to 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.

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

- To move the cartridge to the first available empty slot, press UP or DOWN to highlight **First Empty Storage Slot** and press ENTER. If your library is configured for more than one logical library, the Select Logical Library screen displays.

  ```
  Select Logical Library       Panel 0025

  Select a logical library:

  Logical Library 2

  [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.

  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.

- 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 a list of SCSI element addresses (in both decimal and hexadecimal format) for drives, I/O station slots, and storage slots that have been configured and are empty. The screen also lists the physical locations of these destinations. 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). To display more SCSI element addresses, press DOWN; to return to addresses that you have viewed, press UP. When you access the screen that contains the SCSI element address that you want, press ENTER. Then, press UP or DOWN to highlight that address and press ENTER.

```
Select Destination Element       Panel 0026

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

Media Type: LTO

257     101h   Drive    [F1,R01]
258     102h   Drive    [F1,R02]
769     301h   I/O Slot [F1,R03]
1028    404h   Slot     [F1,C01,R04]
1029    405h   Slot     [F1,C01,R05]
1030    406h   Slot     [F1,C01,R06]
1031    407h   Slot     [F1,C01,R07]
1032    408h   Slot     [F1,C01,R08]
1033    409h   Slot     [F1,C01,R09]
1034    40Ah   Slot     [F1,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 a list of empty storage slots, I/O slots, or drives. 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). To display more locations, press DOWN; to return to locations that you have viewed, press UP. When you access the screen that contains the location that you want, press ENTER. Then, press UP or DOWN to highlight that location and press ENTER.

```
Select Destination Location         Panel 0027

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

Drive    [F1,R01]
Drive    [F1,R02]
I/O Slot [F1,R03]
Slot     [F1,C01,R04]
Slot     [F1,C01,R05]
Slot     [F1,C01,R06]
Slot     [F1,C01,R07]
Slot     [F1,C01,R08]
Slot     [F1,C01,R09]
Slot     [F1,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.

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

Displaying the Existing Configuration

To display the 3584 UltraScalable Tape Library's current physical and logical configuration, use one of the following methods.

From the Web

To use the library's 3584 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. Click Physical Library for a physical configuration of the library, or click Logical Libraries 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

[BACK]  [ UP ]  [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 Configuration

[BACK]  [ UP ]  [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.

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

[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
    Storage Slots:   175
    I/O Slots:        28

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

  To view the details for additional frames, press DOWN. 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 UP. 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:     0100
Elem Addr Range:   1025 - 1124
Location Start:    [F1,C01,R02]
Location End:      [F1,C06,R13]

Drives:            004
Elem Addr Range:   0257 - 0260
Location Start:    [F1,R01]
Location End:      [F1,R04]

Control paths:
[F1,R01]

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

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 DOWN. 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:     0080
Elem Addr Range:   1598 - 1677
Location Start:    [F2,C01,R03]
Location End:      [F2,C03,R10]

Drives:            002
Elem Addr Range:   0281 - 0282
Location Start:    [F2,R01]
Location End:      [F2,R02]

Control paths:
[F2,R00]

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

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

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

Configuring the Library without Partitions

When you configure the 3584 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 3584 Specialist web interface, refer to the appropriate section in "Configuring the Library by Using Labels" on page 108.

From the Operator Panel

1. Open the front door of each frame, and 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 113.)
2. 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]
```

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

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

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

```
Configuration                   Panel 0101

Display Configuration
Configure Library
Advanced Configuration

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

5. 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.**

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 may 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:              2
Total Drives:              2
Total Storage Slots:     597
Total I/O Slots:          30

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

8. Press ENTER. The library displays the message **Do you want to commit the new physical configuration?**

9. Perform one of the following steps:
   - Press YES to accept the new physical configuration and to set up a logical library configuration. 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 15 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

Storage Slots:     0597
Elem Addr Range:   1025 - 1621
Location Start:    [F1,C01,R02]
Location End:      [F2,C10,R44]

Drives:            002
Elem Addr Range:   0257 - 0258
Location Start:    [F1,R01]
Location End:      [F1,R02]

Control paths:
[F1,R01]

[BACK]  [ENTER]
```

Table 15. SCSI Data Transfer Element (DTE) Addresses for Tape Drives

SCSI DTE Addresses for Tape Drives						
	Frame 1	**Frame 2**	**Frame 3**	**Frame 4**	**Frame 5**	**Frame 6**
Row 1	257(X'101')	269(X'10D')	281(X'119')	293(X'125')	305(X'131')	317(X'13D')
Row 2	258(X'102')	270(X'10E')	282(X'11A')	294(X'126')	306(X'132')	318(X'13E')
Row 3	259(X'103')	271(X'10F')	283(X'11B')	295(X'127')	307(X'133')	319(X'13F')
Row 4	260(X'104')	272(X'110')	284(X'11C')	296(X'128')	308(X'134')	320(X'140')
Row 5	261(X'105')	273(X'111')	285(X'11D')	297(X'129')	309(X'135')	321(X'141')
Row 6	262(X'106')	274(X'112')	286(X'11E')	298(X'12A')	310(X'136')	322(X'142')
Row 7	263(X'107')	275(X'113')	287(X'11F')	299(X'12B')	311(X'137')	323(X'143')
Row 8	264(X'108')	276(X'114')	288(X'120')	300(X'12C')	312(X'138')	324(X'144')
Row 9	265(X'109')	277(X'115')	289(X'121')	301(X'12D')	313(X'139')	325(X'145')
Row 10	266(X'110')	278(X'116')	290(X'122')	302(X'12E')	314(X'13A')	326(X'146')
Row 11	267(X'111')	279(X'117')	291(X'123')	303(X'12F')	315(X'13B')	327(X'147')
Row 12	268(X'10C')	280(X'118')	292(X'123')	304(X'130')	316(X'13C')	328(X'148')
Note: Addresses are given in decimal and hexadecimal format.						

10. Press ENTER. 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. This would make them unavailable to the logical library they are in now. Do you want to commit the new logical configuration?**
11. Perform one of the following:
    - Press YES to accept the new configuration (the library may 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.
12. Press BACK until you return to the Activity screen.

Configuring the Library with Partitions

When you configure the 3584 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 3584 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 117.

Configuring the Library by Using Labels

Preparing for the Configuration

1. 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 35 on page 229, Table 36 on page 231, and Table 38 on page 233).
2. Open the front door of one or more frames, and 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 1. 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 113.)

   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.
3. Close the front door 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 3584 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. Click Settings | Library Configuration. The Logical Libraries screen displays.
3. Click the drop-down box and select the logical library that you want to configure. The screen displays that library's current configuration.
4. Click the Configuration Wizard link and follow the instructions on the screens until the Select Configuration Method screen displays.
5. Click the Automated configuration button, then click the Next button. The library scans the bar code labels and creates the logical library.
6. 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

[BACK]  [ UP ]  [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 Configuration

[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 may 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

[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 15 on page 106 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:    [F1,C01,R02]
Location End:      [F1,C06,R44]

Drives:            004
Elem Addr Range:   0257 - 0260
Location Start:    [F1,R01]
Location End:      [F1,R04]

Control paths:
[F1,R01]

[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.**

   - If you do not want to move cartridges or drives to a new logical library, press BACK to return to the Configuration screen, and move the labels to the storage slots and drives that you want.
   - If you want to accept the new configuration, press ENTER to continue.

10. Perform one of the following:
    - Press YES to accept the new configuration (the library may 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.
11. Press BACK until you return to the Activity screen.

Attaching and Removing Logical Library Bar Code Labels

Each frame of the 3584 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 32.

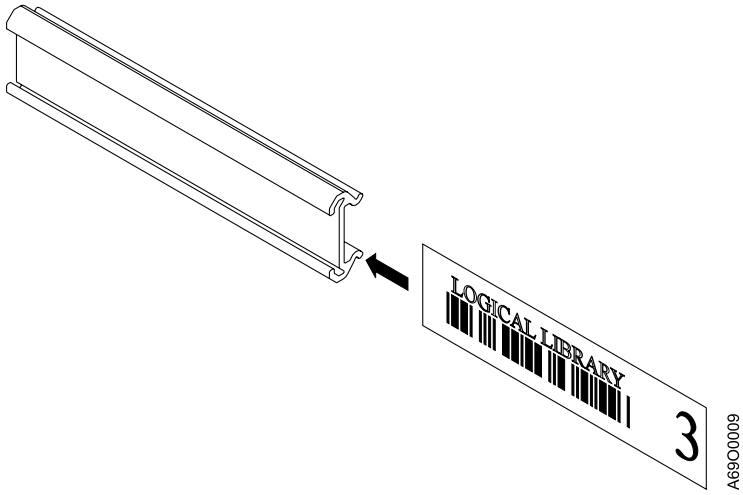


Figure 32. Logical Library Bar Code Label and Holder

To label the storage slot columns and drives in your logical library, follow the procedures in Table 16 on page 114.

Table 16. 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 32 on page 113). 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 33). 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 33). 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.

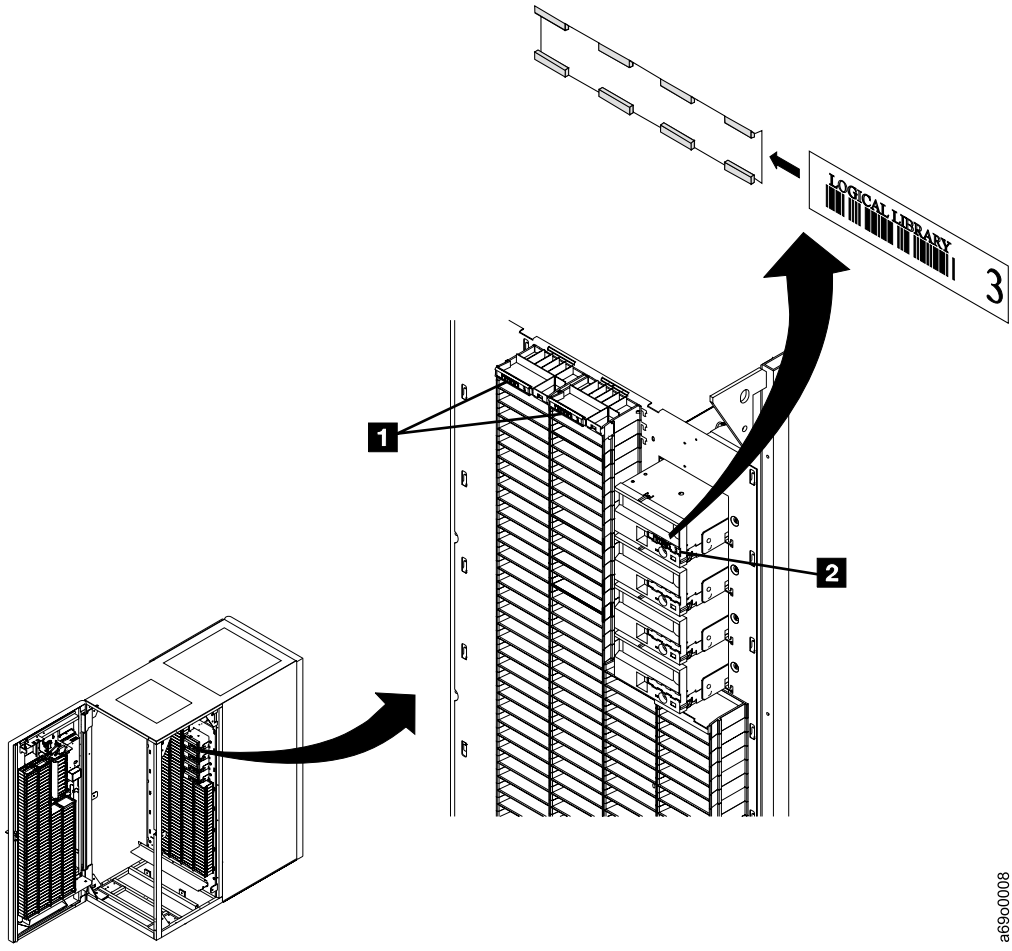


Figure 33. Attaching Logical Library Bar Code Labels. Place the labels at the top of storage slot columns or drives.

Guidelines for Applying Labels: To indicate the boundaries of your logical library with labels, refer to Figure 34 on page 116 and use the following guidelines:

- If you use mixed media, configure the LTO and DLT elements (drives and storage slots) into separate logical libraries.
- Regardless of whether you use mixed media, 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 use mixed media and 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 117.
- 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 3584 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 34 on page 116.
- 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 media, 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.

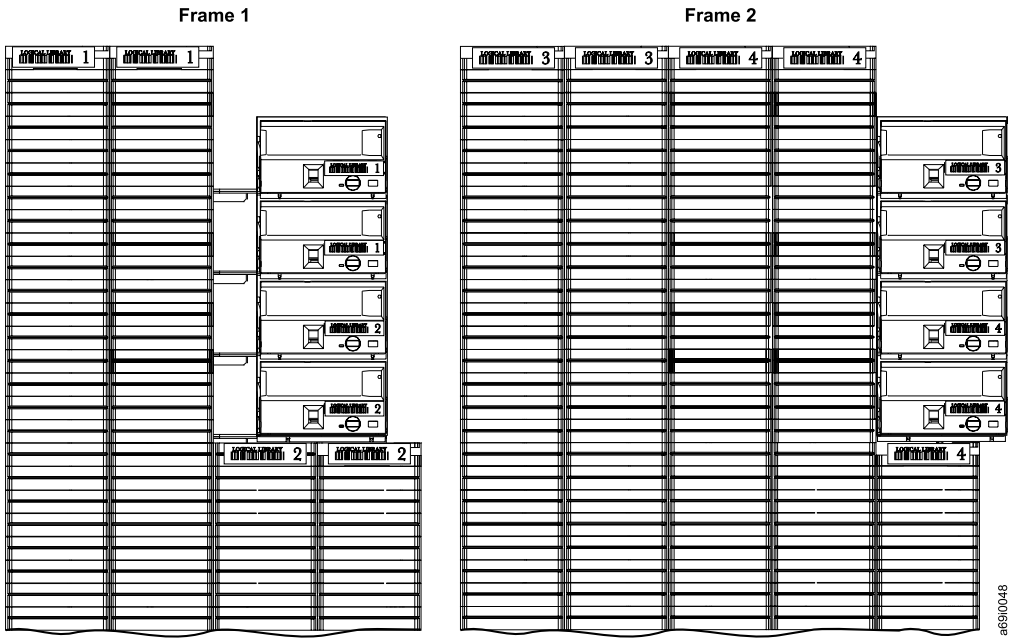


Figure 34. Indicating the Boundaries of Logical Libraries

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 3584 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. Click the Configuration Wizard link and follow the instructions on the screens until the Choose Configuration Method screen displays.
4. Click 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 may first configure a range of DLT elements, then a range of LTO 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. Library Capacity" on page 209).
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
NetworkDate/Time
Sounds

[BACK]  [ UP ]  [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 Configuration

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

5. Press UP or DOWN to highlight Advanced Configuration 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 may 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

[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 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
Frames 1 - 1

Number of Logical Libraries:  1

Select 1 - 12

[CANCEL]   [ UP ]   [DOWN]   [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.

    Note: If you specify a quantity that is less than the quantity in the existing configuration and if there are cartridges in the library (the library is not empty), the library displays the message **Reducing the number of logical libraries 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.** Perform one of the following:
    - Press BACK to return to the Set Logical Libraries screen and change the quantity of logical libraries.
    - Press ENTER to continue with the configuration.

```
Set Storage Slots       Panel 0106

Logical Library 1

Number of 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.

Perform one of the following steps:

- Press BACK to return to the Set Storage Slots screen and change the quantity of storage slots.
- Press ENTER to continue with the configuration.

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 in step 10 on page 119 you specified that you wanted to configure more than one logical library, the Set Storage Slots screen redisplays. Repeat step 11 on page 119 and step 12 to add the storage slots and drives that you want for the next logical library. When you have configured all logical libraries, the library displays the message **The following panel will display the new logical configuration information.**

13. Press ENTER. The Configuration Summary screen displays for Logical Library 1. The screen contains the quantity and range of SCSI element addresses for the cartridge storage slots and the drives.

    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 15 on page 106 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:    [F1,C01,R02]
Location End:      [F1,C06,R13]

Drives:            004
Elem Addr Range:   0257 - 0260
Location Start:    [F1,R01]
Location End:      [F1,R04]

Control paths:
[F1,R01]

[BACK]  [ENTER]
```

14. Press ENTER to display the Configuration Summary screen for each 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). 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?**
15. Press YES. The library may take several minutes to process the new logical configuration. When finished, it displays the message **The Configuration process is complete**.
16. Press ENTER to return to the Configuration screen.
17. 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 3584 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, click 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, click 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

[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 ]  [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 [F1,R01]      SCSI ID  0
Drive [F1,R02]      Loop ID 18
Cport [F2,R00]      SCSI ID 13
Drive [F2,R01]      SCSI ID  0
Drive [F2,R02]      SCSI ID  1
Cport [F2,R03]      SCSI ID  2
Cport [F2,R04]      SCSI ID  3
Drive [F2,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 3584 UltraScalable Tape Library assigns a default SCSI ID to each tape drive that uses 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 3584 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, click Settings | Drive SCSI/Loop IDs. 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 change a control port's SCSI ID, click 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 click the radio button on the left to select it, then click the Change ID button. A drop-down list displays the available IDs.
4. Click on the new ID to select it, then click the Change ID 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

[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 ]  [DOWN]  [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 [F1,R01]      SCSI ID  0
Drive [F1,R02]      Loop ID 18
Cport [F2,R00]      SCSI ID 13
Drive [F2,R01]      SCSI ID  0
Drive [F2,R02]      SCSI ID  1
Cport [F2,R03]      SCSI ID  2
Cport [F2,R04]      SCSI ID  3
Drive [F2,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 warning 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 [F1,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 control port, the screen gives the physical location of the selected control port and its current SCSI ID.

```
Change SCSI/Loop ID     Panel 0122

Key: [F=Frame, R=Row]

CPort [F2,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 **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 3584 UltraScalable Tape Library assigns a World Wide Port Name to each Fibre Channel tape drive. To determine the World Wide Port Name for a drive, use one of the following methods.

From the Web

To use the library's 3584 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. Click 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

[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]

[F1,R01]  5005 0763 0041 0001
[F1,R02]  5005 0763 0041 0002
[F1,R03]  5005 0763 0041 0003
[F1,R04]  5005 0763 0041 0004
[F1,R05]  5005 0763 0041 0005
[F1,R06]  5005 0763 0041 0006
[F1,R07]  5005 0763 0041 0007
[F1,R08]  5005 0763 0041 0008

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

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

Displaying a World Wide Node Name

The 3584 UltraScalable Tape Library assigns a World Wide Node Name to 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 3584 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. Click 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

[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]

[F1,R01]  5005 0763 0041 0001
[F1,R02]  5005 0763 0041 0002
[F1,R03]  5005 0763 0041 0003
[F1,R04]  5005 0763 0041 0004
[F1,R05]  5005 0763 0041 0005
[F1,R06]  5005 0763 0041 0006
[F1,R07]  5005 0763 0041 0007
[F1,R08]  5005 0763 0041 0008

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

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

Displaying Control Paths

The 3584 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 3584 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 breakdown in 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 3584 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. Click 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

[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 ]  [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.

```
Display Control Paths          Panel 0131

Key: [LL=Logical Library, F=Frame, R=Row]

LL1 Drive [F1,R01]    Required
LL1 Drive [F1,R02]    Disabled
LL2 CPort [F2,R00]    Required
LL3 Drive [F3,R01]    Required
LL3 Drive [F3,R02]    Disabled
LL3 Drive [F3,R03]    Disabled
LL4 CPort [F4,R00]    Required
LL5 Drive [F5,R01]    Required
LL5 Drive [F5,R02]    Disabled
LL5 Drive [F5,R03]    Disabled

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

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

Changing a Control Path

To change a control path, use one of the following methods.

From the Web

To use the library's 3584 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. Click 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

[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 ]  [DOWN]  [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.

```
Display Control Paths          Panel 0131

Key: [LL=Logical Library, F=Frame, R=Row]

LL1 Drive [F1,R01]    Required
LL1 Drive [F1,R02]    Disabled
LL2 CPort [F2,R00]    Required
LL3 Drive [F3,R01]    Required
LL3 Drive [F3,R02]    Disabled
LL3 Drive [F3,R03]    Disabled
LL4 CPort [F4,R00]    Required
LL5 Drive [F5,R01]    Required
LL5 Drive [F5,R02]    Disabled
LL5 Drive [F5,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 Change 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 BACK to return to the previous screen.

```
Change Control Path     Panel 0132

Key: [LL=Logical Library, F=Frame, R=Row]

LL1 Drive [F1,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 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.

Selecting the Network Settings

Note: Not implemented in the 3584 Specialist web interface.

Use the following steps to view or change network options that the 3584 UltraScalable Tape Library uses to connect to other devices:

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 Settings
Date/Time
Sounds

[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 the application or network that you want and press ENTER. Depending on the parameter that you chose, the following screens display.
   - **If You Selected SNMP:** The SNMP menu displays with several selections. Options are available to enable or disable the Simple Network Management Protocol (SNMP). SNMP provides the server with alerts and status information that is generated by the library. The menu lets you view or change the destination Internet protocol (IP) addresses of clients to which the SNMP alerts are sent. An IP address is an identifier that is unique to each device. It consists of a network and device address, both of which are assigned by your system administrator. Use this menu to display or change the remote port that is associated with the IP address. You can also use this menu to display or change the community name (a series of characters that both the library and the server must have to communicate), or to send an SNMP test trap (message) to a host.

```
SNMP                        Panel 0165

Enable/Disable SNMP
Destination IP Addresses
Remote Port
Community Name
Send a Test Trap

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

- Perform one of the following procedures:
  - To enable or disable SNMP, press UP or DOWN to highlight Enable/Disable SNMP and press ENTER. The Enable/Disable SNMP screen displays with the current state of SNMP. Press UP or DOWN to specify ENABLED or DISABLED for SNMP. The SNMP screen redisplays the new setting. To accept the new setting and return to the previous screen, press CANCEL.

    ```
    Enable/Disable SNMP          Panel 0166

    SNMP is ENABLED

    Press UP or DOWN to toggle the
    SNMP setting, then press ENTER
    to activate the change.

    [CANCEL]  [ UP ]  [DOWN]   [ENTER]
    ```

  - To view or change the destination IP address of a client to which SNMP alerts will be sent, press UP or DOWN to highlight Destination IP Addresses and press ENTER. The IP Addresses screen displays with the current destination IP setting. The maximum quantity of addresses is five.

    ```
    IP Addresses             Panel 0170

    Select IP Address to view/change.

    IP Address  2

    Select 1 - 5

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

    Press UP or DOWN to specify the destination IP address that you want to view or change, then press ENTER. The Set Destination IP Address screen displays with the current value of the destination IP address that you specified. 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]
    ```

    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 CANCEL.

Note: To disable an address, specify 0 for the first character. The library automatically enters zeroes for all characters and disables the address.

– To view or change the remote port that is associated with the IP address, 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]
```

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 **Changing Remote Port X to YYY** (where X equals the port associated with the destination IP address and YYY equals the value of the remote port). When the update is finished, **Remote Port X is now YYY** displays. Press CANCEL to return to the SNMP screen.

```
Set Remote Port          Panel 0169

Remote Port: [162]

Use UP or DOWN to change
highlighted value.

[CANCEL]  [ UP ]  [DOWN]   [ENTER]
```

– To view or change the community name, press UP or DOWN to highlight Community Name and press ENTER. The Community Name screen displays with the current password.

```
Community Name             Panel 0167

Community Name:
public

Press UP/DOWN to select 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 **Updating Community Name** and the update of the password begins. When the update is finished, **Community Name change** displays. Press ENTER to display the new password.

– To send a test trap (message), 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.** 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 23.

- **If You Selected Ethernet:** the Ethernet screen displays Ethernet settings for Frame 1. The screen contains the Media Access Control (MAC) address, the Internet protocol (IP address), the subnet mask address, and the gateway address. The MAC address is defined by the manufacturer of the Ethernet chip and cannot be changed. The 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). The subnet mask address identifies the library's local area network (LAN). The gateway address is the location at which networks attach to each other. 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

[Change Settings]

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

To change the Ethernet setting, press ENTER. The Change Ethernet Settings menu displays.

```
Change Ethernet Settings          Panel 0176

Disable
DHCP
Manual

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

You can disable the current Ethernet settings, use the Dynamic Host Configuration Protocol (DHCP) server settings, or manually change the IP address, subnet mask address or gateway setting. The DHCP server acts as an administrator for the network (for example, when queried, it can tell the library what kind of device it is). To change an Ethernet setting, perform one of the following procedures:

– To disable the Ethernet settings, press UP or DOWN to highlight Disable and press ENTER. The library displays the message **If you select [ENTER], the Ethernet Settings will be disabled.** Press ENTER to disable the settings. The library displays the message **Ethernet Disabled** and redisplays the Ethernet Settings screen.
– To enable and use the settings of the DHCP server, press UP or DOWN to highlight 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 obtain the settings. The library displays the message **DHCP Enabled** and redisplays the Ethernet Settings screen.
– To enable and manually change the settings for the IP address, subnet mask address, and gateway address, press UP or DOWN to highlight Manual and press ENTER (to determine your library's appropriate addresses, see your network administrator). The Manual Ethernet Settings screen displays.

```
Manual Ethernet Settings       Panel 0176

IP Address:  19.117.63.126
Subnet Mask: 255.255.253.0
Gateway:     19.117.63.253

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

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 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 **Ethernet Settings updated**. Press ENTER. The Manual Ethernet Setting screen displays. To accept the new setting and return to the previous screen, press CANCEL.

- **If You Selected Web Server:** the Web Server menu displays options that let you change, enable a new, or disable an administrator user ID or password.

```
Web Server              Panel 0185

Change Password
Disable UserID/Password

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

  Perform one of the following procedures:

  – To enable a new password or to change a password, you can perform a procedure from the library's 3584 Specialist web interface or from its operator panel:

    - **Enabling or Changing a Password from the Web:**

      a. Type the Ethernet IP address on the URL line of the browser and press Enter. The Introduction screen displays.

      b. Click Settings | Security. The Security screen displays and lets you enable or change the administrator user password. The maximum number of characters is 15. The password is required to perform certain administrative functions, such as moving a cartridge (for a list of all password-protected functions, see "Security" on page 56). After you enable a password and attempt to access a protected screen, the library prompts you to enter your userid (**admin**) and the password that you enabled.

    - **Enabling or Changing a Password from the Operator Panel:** Press UP or DOWN to highlight Change Password and press ENTER. The Password screen displays with the current password.

```
Change Password          Panel 0186

Password: AdminPassword

Press UP/DOWN to select the
current character. ENTER
selects the next character.
ENTER on a blank commits
changes.

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

      Note: The maximum number of characters for a password is 15. To change the password, press UP or DOWN to specify the first character that you want and press ENTER. The screen highlights the second character. Continue to press UP or DOWN and ENTER to specify each character until you have typed the password. Press ENTER. The library displays the message **Password change complete**. Press ENTER. The Password screen redisplays with the new information.

  – To disable a user ID or password, press UP or DOWN to highlight Disable User ID/Password and press ENTER. The library displays the message **If you press [ENTER], ID/Password restriction of web pages will be disabled**. Press ENTER to disable the password. The library displays the message **Web password protection is disabled**. Press ENTER. The Web Server menu redisplays.

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

Changing the Date and Time

To change the date and time settings on your 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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

[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]  [ UP ]  [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 3584 Specialist web interface.

The 3584 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

[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 **Are you sure you want to set Beep Mode to x?** (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.

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 3584 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. Click 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]  [ UP ]  [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 1:

  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 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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. Click Physical Library | Drives. The Drives screen displays.
3. Click the radio button of the drive that you want.
4. Click 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]

Drive [F1,R01]
Drive [F1,R02]
Drive [F1,R03]
Drive [F1,R04]
Drive [F1,R05]
Drive [F1,R06]
Drive [F1,R07]
Drive [F1,R08]
Drive [F1,R09]
Drive [F1,R10]

[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  [F1, 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 accessor.

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 3584 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. Click Physical Library | Cartridges. The Cartridges screen displays.
3. Click the Display all cleaning cartridges link. The Cleaning Cartridges screen displays with 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 ]  [DOWN]  [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 3584 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.

```
Cleaning Cartridge Usage        Panel 0220

CLN01:      020     DLT
CLNI02L1:   020     LTO
CLNI03L1:   015     LTO
CLNI04L1:   010     LTO
CLN05:      005     DLT
CLN06:      000     DLT
CLNI07L1:   000     LTO
CLN08:      000     DLT
CLN09:      000     DLT
CLNI10L1:   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 3584 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 3584 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. Click Service | Vital Product Data. 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. (The screen also displays VPD for the drives, control ports, and node cards.)

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 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 3584 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. Click Service | Vital Product Data. The Vital Product Data screen displays the location, SCSI Inquiry identification (drive type), and version of firmware for each drive. (The screen also displays VPD for the library, control ports, and node cards.)

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 Tape Drives and DLT8000 for DLT 8000 Tape Systems). It also gives the version of firmware loaded on each drive. 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]

[F1,R01] ULT3580-TD1 v1234
[F1,R02] ULT3580-TD1 v1234
[F1,R03] ULT3580-TD1 v1234
[F1,R04] ULT3580-TD1 v1234
[F1,R05] ULT3580-TD1 v1234
[F1,R06] ULT3580-TD1 v1234
[F1,R07] ULT3580-TD1 v1234
[F1,R08] ULT3580-TD1 v1234

[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, 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 3584 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. Click Service | Vital Product Data. The Vital Product Data screen displays the location of the library's node cards, as well as their part numbers, serial numbers, and version of software. (The screen also displays VPD for the library, drives, and control ports.)

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:  1000

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

   To view VPD for the motor driver assembly, Medium Changer card pack, and operator panel assembly in Frame 1, press DOWN. Continue to press DOWN to view the VPD for node cards in other frames. To return to previous screens, press UP.

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 3584 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. Click Service | Vital Product Data. The Vital Product Data screen displays the location and version of firmware for each control port. (The screen also displays VPD for the library, drives, and node cards.)

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 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

CPort [F2,R00]

  Firmware Version:  1000

[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.

Updating Library Firmware

To update the firmware for the 3584 UltraScalable Tape Library, use one of the following methods.

From the Web

To use the library's 3584 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. Click Service | Firmware Update. The Firmware Update screen displays.
3. Click the Library firmware link to download the new firmware image that you need, then click the Firmware Update Wizard to update your firmware.

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*.

Updating Drive Firmware

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 3584 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. Click Service | Firmware Update. The Firmware Update screen displays.
3. Depending on the type of firmware that you want to update, click one of the following choices to download a new firmware image.
   - LTO drive firmware - FC (to update an Ultrium Tape Drive with a Fibre Channel interface)
   - LTO drive firmware - SCSI (to update an Ultrium Tape Drive with a SCSI interface)
4. Click the Firmware Update Wizard to update your firmware.

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*.

Updating Control Port Firmware

To update the firmware for a control port in the 3584 UltraScalable Tape Library, use the following method.

From the Web

To use the library's 3584 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. Click Service | Firmware Update. The Firmware Update screen displays.
3. Click Control port firmware to download the new firmware image that you need, then click the Firmware Update Wizard to update your firmware.

Chapter 5. Using Ultrium Media

The 3584 UltraScalable Tape Library automates the storage and movement of IBM LTO Ultrium Tape Cartridges. Within the library, the Ultrium Tape Drive uses the following cartridge types:

- IBM LTO Ultrium Data Cartridge
- IBM LTO Ultrium Cleaning Cartridge
- Diagnostic cartridge

To ensure that your tape library conforms to IBM's specifications for reliability, use only the preceding cartridges. You may use other LTO-certified data cartridges, but they may not meet the standards of reliability established by IBM. The IBM LTO Ultrium Data Cartridge cannot be interchanged with the media used in other IBM non-LTO Ultrium tape products.

Figure 35 shows the IBM LTO Ultrium Data Cartridge and its components.

1	Cartridge door	4	Label area
2	Leader pin	5	Insertion guide
3	Write-protect switch		

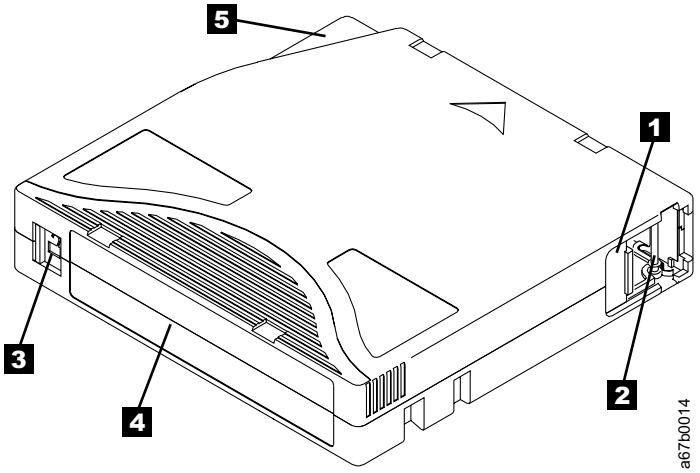


Figure 35. The IBM LTO Ultrium Data Cartridge

Data Cartridge

The IBM LTO Ultrium Data Cartridge contains 1/2-inch, metal-particle tape that has a native data capacity of 100 GB, and a compressed capacity of 200 GB (assuming 2:1 compression). When processing the tape, the Ultrium Tape Drive uses a linear, serpentine recording format, and reads and writes data on 384 tracks, 8 tracks at a time. The first set of 8 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 8 tracks for the return pass. This process continues until all tracks are written and the tape is full, or until all data is written.

The IBM LTO Ultrium Data Cartridge includes a Linear Tape-Open Cartridge Memory (LTO-CM) chip, which 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 3584 Tape Library writes any pertinent information to the cartridge memory.

The cartridge door (**1** in Figure 35 on page 161) protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader pin **2** . 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 **3** prevents data from being written to the tape cartridge. On the IBM LTO Ultrium Data Cartridge, the switch is red; on the IBM LTO Ultrium Cleaning Cartridge, the switch is gray. The label area **4** 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 3584 Tape Library. The insertion guide **5** 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 174.

The IBM LTO Ultrium Data Cartridge has a nominal cartridge life of 5000 load and unload cycles.

Cleaning Cartridge

To maintain the operating efficiency of the drive, IBM supplies a specially labeled IBM LTO Ultrium Cleaning Cartridge with the first Ultrium Tape Drive in each Model L32 or D32 frame of the 3584 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 22).

Note: The volume serial number (VOLSER) on the cleaning cartridge’s bar code label must begin with **CLNI** or the library treats the cleaning cartridge as a data cartridge during an inventory. Note that the prefix for the LTO Ultrium Cleaning Cartridge (CLNI) differs from the prefix for the DLTtape IV Cleaning Cartridge (CLN).

Before a drive can be cleaned, you must ensure that an IBM LTO Ultrium 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 72). 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 39).

The 3584 Tape Library monitors the use of all cleaning cartridges. A cleaning cartridge is valid for 50 cleanings. When the cartridge expires, the library displays the following message on the Activity screen (where xxxx equals the VOLSER of the cleaning cartridge):

```
Remove CLNIxxxx
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 72.

Bar Code Label

Each data, cleaning, and diagnostic cartridge that is processed by the 3584 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, L1. `L` identifies the cartridge as an LTO cartridge; `1` indicates that the cartridge is the first generation of its type. Figure 36 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 174. The bar code must meet predefined specifications. They include (but are not limited to):

- Eight alphanumeric characters, where the last two characters must be `L1`
- 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://www.ibm.com/storage/lto` 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 35 on page 161). 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 3584 Tape Library from reading the label.

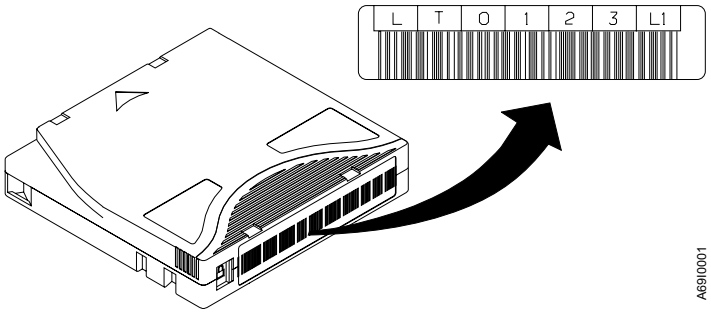


Figure 36. Sample Bar Code Label on the LTO Ultrium Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.

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 **4** in Figure 35 on page 161).
- 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.

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 Representatives will use the cartridge to ensure that the tape drives run correctly and to specification.

Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 37) determines whether you can write to the tape:

- If the switch is set to  data cannot be written to the tape.
- If the switch is set to  data can be written to the tape.

If possible, use your host's application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the host 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.

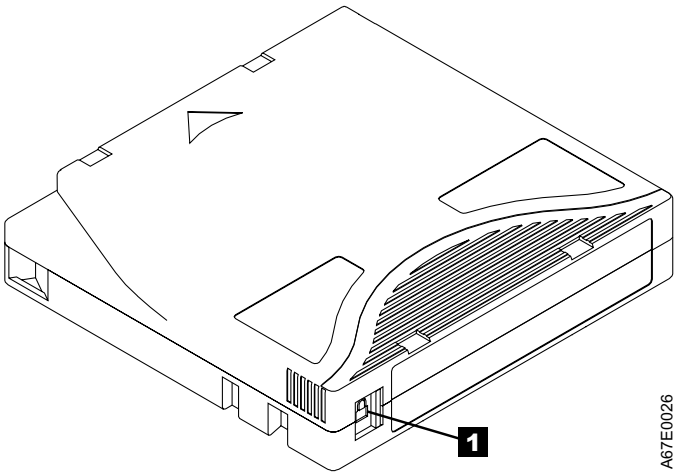


Figure 37. Setting the Write-Protect Switch

Reattaching a Leader Pin

If the leader pin detaches from the tape in your cartridge, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reattach it. (Do not reattach the pin if you must remove more than 7 m (23 ft) of leader tape; instead, contact your IBM Service Representative.)

The first meter of tape is leader tape. If 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 38) - A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure 38) - 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 38) - 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.

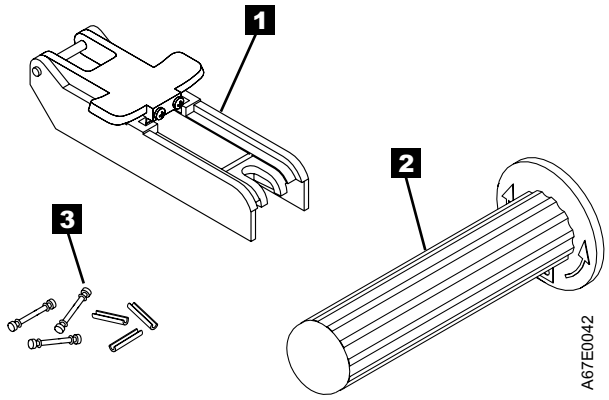


Figure 38. Leader Pin Reattachment Kit

To reattach a leader pin by using the IBM Leader Pin Reattachment Kit:

1. Attach the leader pin attach tool (**1** in Figure 39) 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** .

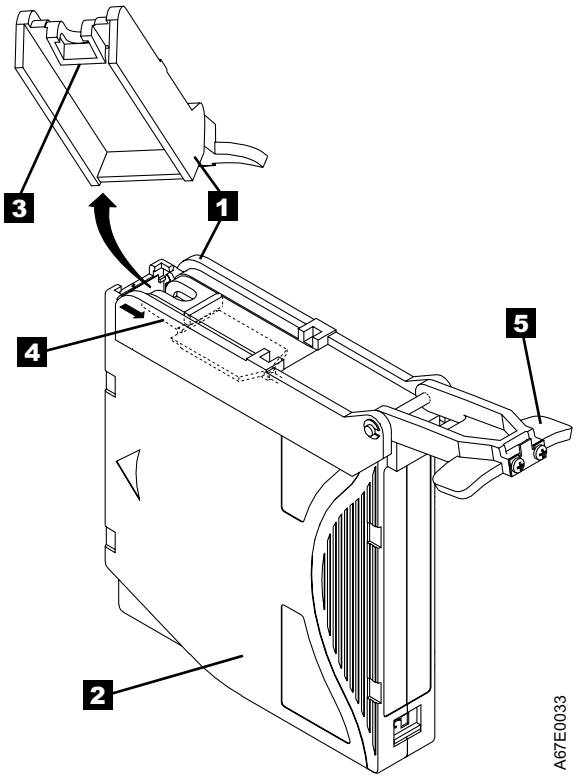


Figure 39. Attaching the Leader Pin Attach Tool to the Cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 40) to the cartridge's hub **2** by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you can 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 12.7 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.

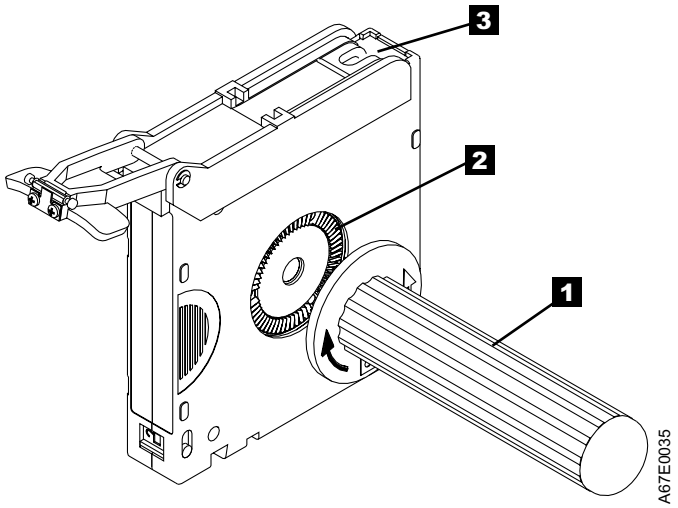


Figure 40. Winding the Tape Out of the Cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (1 in Figure 41), locate the open side of the C-clip 2 . The C-clip is a small black part that will secure 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.

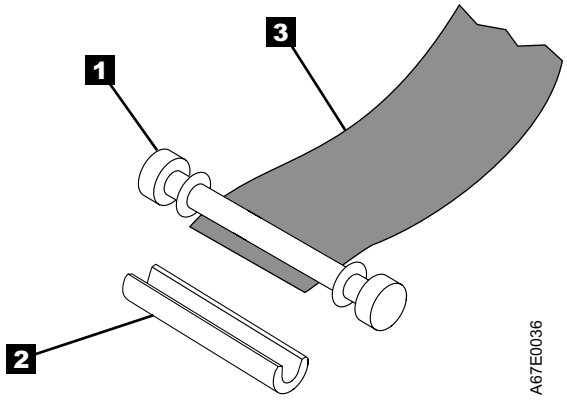


Figure 41. Removing the C-Clip from the Leader Pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see 1 in Figure 42 on page 171).
8. Place a new C-clip into the retention groove 2 (Figure 42 on page 171) 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) into the cavity 3 (Figure 42 on page 171) 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 (Figure 42).

    Note: Use care to ensure that the tape is centered over the leader pin. Failure to properly center the tape on the leader 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.

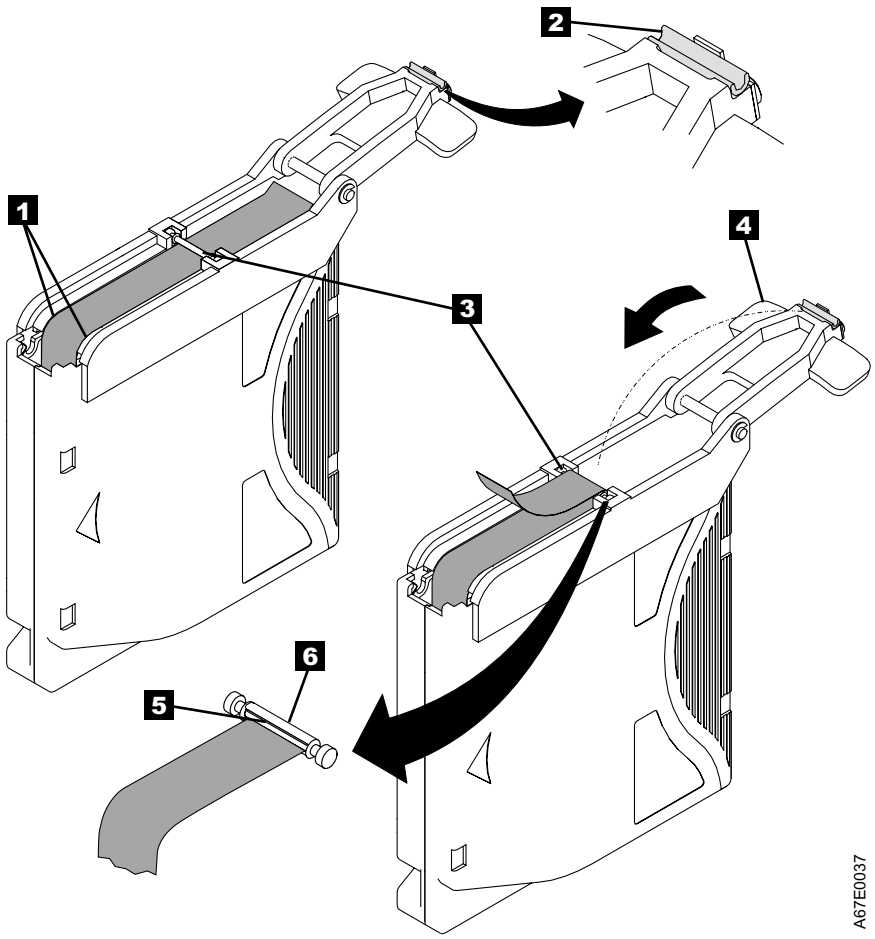


Figure 42. Attaching the Leader Pin to the Tape

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.

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.

Handling the Cartridges

Incorrect handling or an incorrect environment can damage the LTO Ultrium Tape Cartridge or its magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your 3584 UltraScalable Tape Library, use the following guidelines:

- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not load a damaged tape cartridge into the 3584 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.
- 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. 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. The bottom of each cartridge has four raised areas that fit into the indented areas on the top of another cartridge. This construction helps prevent the cartridges from sliding when you move them.
- Do not expose the tape cartridge to moisture or direct sunlight.
- 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, 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 173.

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 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 17 gives the environment for operating, storing, and shipping LTO Ultrium Tape Cartridges.

Table 17. 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)	20 to 80%	20 to 80%	20 to 50%	20 to 80%
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, or country (non-U.S.A.) 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 18 lists the LTO Ultrium cartridges and media supplies that you can order for the 3584 Tape Library.

Table 18. Ordering Media Supplies for the 3584 Tape Library

Supply Item	Method of Ordering
Standard LTO Ultrium Data Cartridge Includes human-writable labels.	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.
Labeled IBM LTO Ultrium Data Cartridge Includes bar code labels that are pre-applied by the manufacturer.	Order 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 002.
Standard IBM LTO Ultrium Cleaning Cartridge Includes human-writable labels.	Order as part number 08L9224 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.
Diagnostic Cartridge	Order as part number 19P0405 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.
Leader Pin Reattachment Kit	Order 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 are required for cartridges read by the 3584 Tape Library and are not available with the Ultrium Data Cartridges or Cleaning Cartridges (feature codes 8757 and 8750, respectively). Table 23 on page 189 shows the bar code labels that you can order.

Table 19. Ordering Bar Code Labels for Ultrium Tape Cartridges

Type of Label	IBM Part Number
Data cartridge (black and white)	19P0031
Data cartridge (color)	19P0033
Cleaning cartridge	08L9267
Diagnostic cartridge	19P0276

You can order bar code labels directly from the following authorized label supplier:

In America and Asia
Colorflex™
697 South Pierce Street
Louisville, CO 80027
U. S. A.
Telephone: 1-888-438-8362
Fax: 303-266-2166
http://www.colorflex.com/tri-optic

In Europe
EDP Europe, Ltd.
43 Redhills Road
South Woodham Ferrers
Chelmsford, Essex CM3 5UL
U. K.
Telephone: +44-1245-322380
Fax: +44-1245-323484
http://www.colorflex.com/tri-optic

Chapter 6. Using DLT Media

In addition to automating the storage and movement of IBM LTO Ultrium Tape Cartridges, the 3584 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 43 shows the DLTtape IV Data Cartridge and its components.

1	Label area	3	Cartridge door
2	Write-protect switch	4	Leader

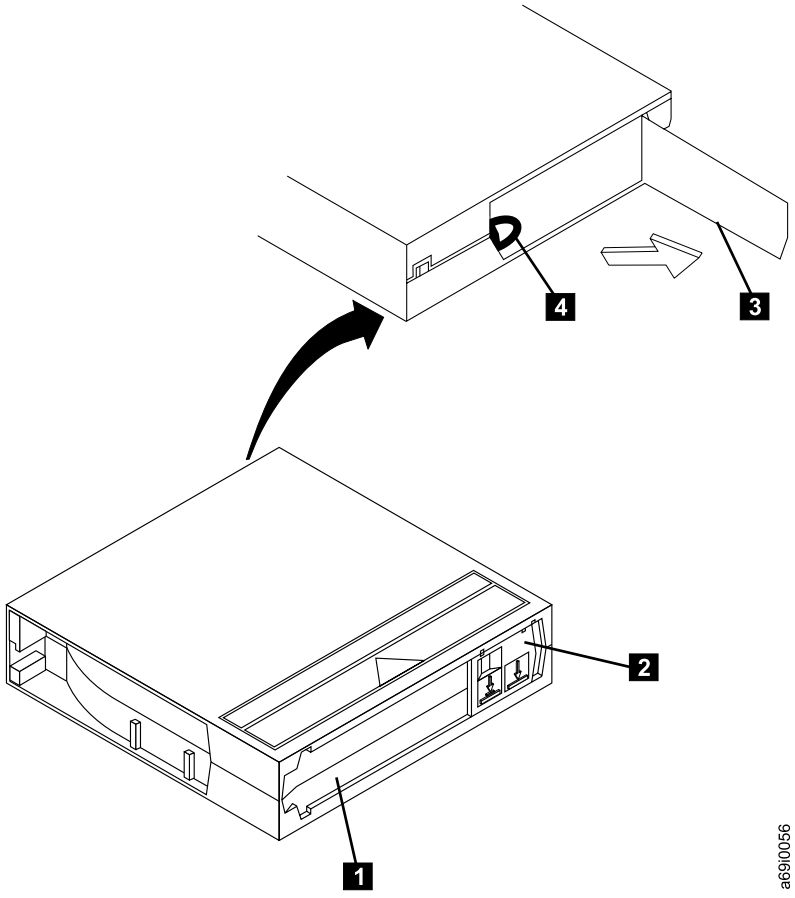


Figure 43. Components of the DLTtape IV Data Cartridge

Data Cartridge

In the 3584 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 3584 Tape Library. The write-protect switch **2** prevents data from being written to the tape cartridge.

The cartridge door (**3** in Figure 35 on page 161) 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 20.

Table 20. 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 188.

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 3584 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 22).

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. Note that the prefix for the DLTtape IV Cleaning Cartridge (CLN) differs from the prefix for the LTO Ultrium Cleaning Cartridge (CLNI).

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 72). 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 39).

The 3584 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 72.

Bar Code Label

Each data, cleaning, and diagnostic cartridge that is processed by the 3584 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 44 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 188. The bar code must meet predefined specifications. The recommended specifications include (but are not limited to):

- Six 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 44). 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 3584 Tape Library from reading the label.

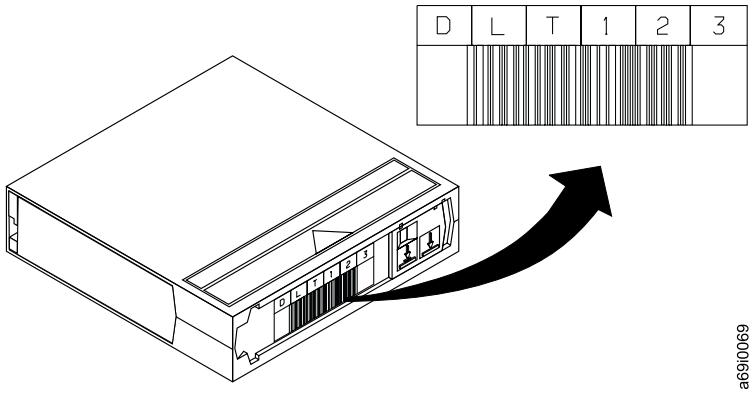


Figure 44. Sample Bar Code Label on the DLTtape IV Tape Cartridge. The volume serial number (DLT123) and bar code are printed on the label.

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 43 on page 177).
- 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.

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.

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 3584 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 183.
- Ensure that all surfaces of the cartridge are dry before inserting it.
- Do not load a damaged tape cartridge into the 3584 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 3584 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 187.

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 45). The tab is one of two cartridge reel locks. If the tab is not visible, dispose of the cartridge.

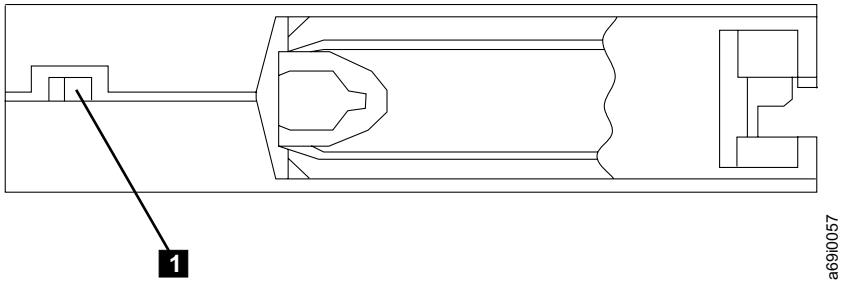


Figure 45. Checking the Cartridge's Side Reel Lock

5. Turn the cartridge over and inspect the white plastic tab on the right (see **1** in Figure 46). 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.

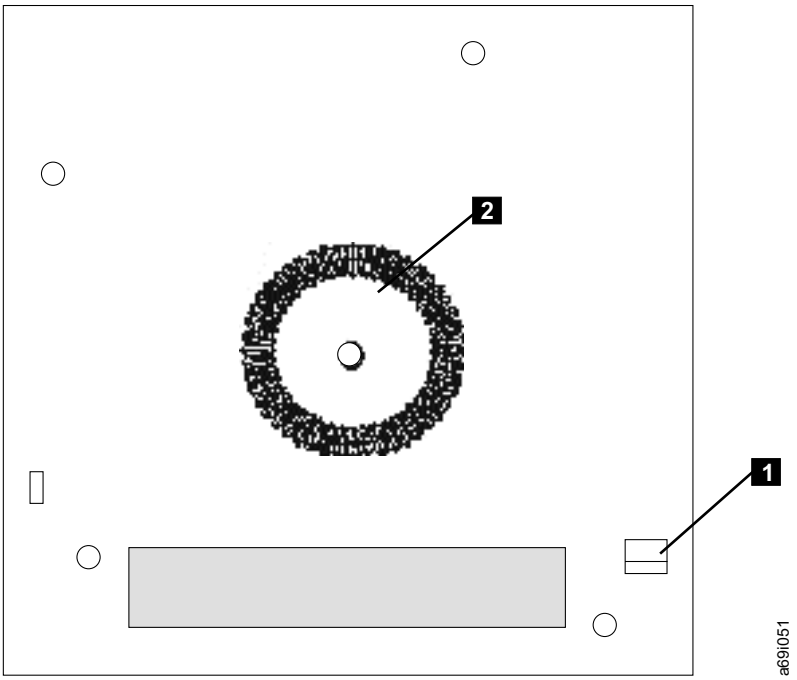


Figure 46. Checking the Cartridge's Bottom Reel Lock

7. Open the cartridge door (**1** in Figure 47 on page 185) by pressing and holding the door-locking tab **2** upward, and pushing it away from you.

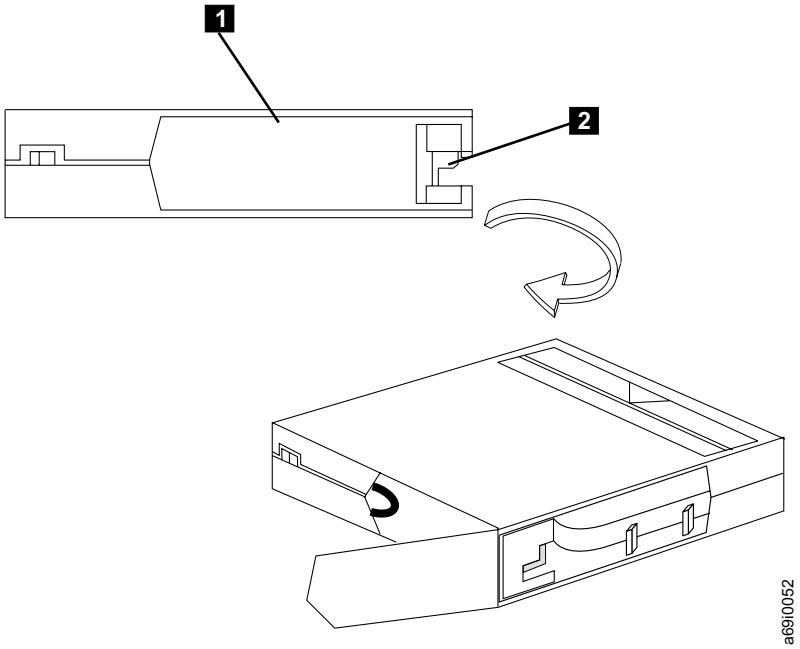


Figure 47. Opening the Tape Cartridge Door

8. Ensure that the tape leader is positioned correctly (see **1** in Figure 48). 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.

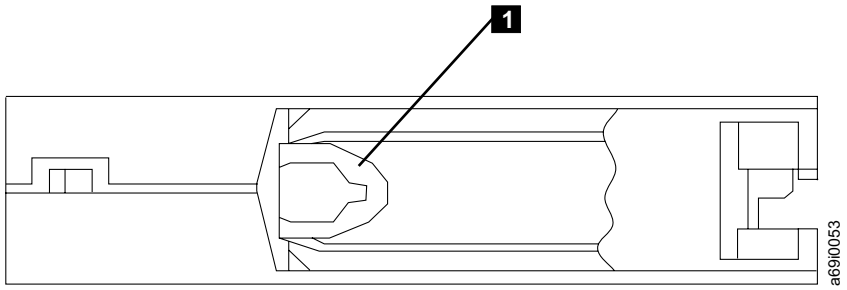


Figure 48. Cartridge Leader in Correct Position

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 49) 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 49 shows the write-protect switch on the tape cartridge.

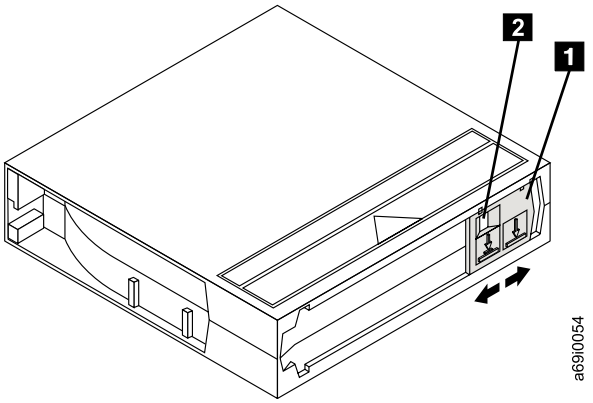


Figure 49. Setting the Write-Protect Switch

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 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 21 gives the environment for operating, storing, and shipping DLTtape IV Tape Cartridges.

Table 21. 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	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, 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, or country (non-U.S.A.) 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 22 lists the DLTtape IV Tape Cartridges that you can order for the 3584 Tape Library.

Table 22. Ordering DLTtape IV Tape Cartridges for the 3584 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 3589 Model 003.
Labeled DLTtape IV Tape Cartridge Includes bar code labels that are pre-applied by the manufacturer (black and white, or color).	Order 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 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.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.

Ordering Bar Code Labels

Bar code labels are required for DLTtape IV Data Cartridge that are read by the 3584 Tape Library. Table 23 shows the bar code labels that are available.

Table 23. Ordering Bar Code Labels for DLTtape IV Tape Cartridges

Type of Label	IBM Part Number
Data cartridge (black and white)	19P2569
Data cartridge (color)	19P2572
Cleaning cartridge	19P2570
Diagnostic cartridge	19P2571

You can order bar code labels directly from the following authorized label supplier. To determine label specifications, contact the supplier.

In America and Asia

Colorflex™
697 South Pierce Street
Louisville, CO 80027
U. S. A.
Telephone: 1-888-438-8362
Fax: 303-266-2166
http://www.colorflex.com/tri-optic

In Europe

EDP Europe, Ltd.
43 Redhills Road
South Woodham Ferrers
Chelmsford, Essex CM3 5UL
U. K.
Telephone: +44-1245-322380
Fax: +44-1245-323484
http://www.colorflex.com/tri-optic

Chapter 7. Using the Fibre Channel Interface

Your IBM Service Representative must perform setup and Fibre Channel configuration of the 3584 UltraScalable Tape Library. The following information is for reference only.

Physical Characteristics of the Fibre Channel Interface

Each Ultrium Tape Drive in a 3584 UltraScalable Tape Library contains one Fibre Channel interface (called a port). The Fibre Channel port runs the SCSI protocol with Fibre Channel tape support.

The 3584 UltraScalable Tape Library supports industry-standard, short-wave subscriber connector (SC), duplex fiber optics cables. This allows for cable lengths of up to 500 meters (1640 feet), with 50-micron core fiber. 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 3584 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 3584 UltraScalable Tape Library supports two topologies: two-node switched fabric loop and two-node arbitrated loop. The sections that follow describe each topology.

Two-node Switched Fabric Loop 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. You can attach the 3584 UltraScalable Tape Library directly to a SAN Fibre Channel Switch (IBM 2109 Switch Models S08 and S16).

The McDATA ED-5000 Director (IBM 2032 Model 001) does not support Fibre Channel-Arbitrated Loop protocol. Thus, the 3584 UltraScalable Tape Library cannot directly connect to the McDATA ED-5000 Director. For details about methods for indirect attachment, see `http://www.storage.ibm.com/ibmsan/products/2032/prod_data/supserver-l00.html`.

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 196).

Two-node Arbitrated Loop Topology

A two-node arbitrated loop is similar to point-to-point topology. Both have two Fibre Channel end points 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.

You can attach the 3584 UltraScalable Tape Library directly to an IBM 3534 SAN Fibre Channel Managed Hub or to an IBM 2103 Fibre Channel Storage Hub Model H07.

Other Arbitrated Loop Topologies (for the IBM @server iSeries)

The IBM @server iSeries supports a loop-only topology (for example, a topology that uses the IBM 3534 SAN Fibre Channel Managed Hub). The @server iSeries server does not support a fabric or switch topology. The loops must be homogeneous iSeries loops only, with no other servers in the loop. Each loop may contain multiple initiators (iSeries servers), but only a single target which may have multiple LUNs.

Fibre Channel Addressing

Each Ultrium Tape Drive in a 3584 UltraScalable Tape Library must have a Loop ID and corresponding Arbitrated Loop Physical Address (AL_PA) to communicate in a Fibre Channel topology. Table 24 lists the default Loop IDs and AL_PAs for each drive in the library.

Table 24. Default Loop IDs and Their Associated AL_PAs for Ultrium Tape Drives in the 3584 UltraScalable Tape Library

Drive	Frame 1		Frame 2		Frame 3		Frame 4		Frame 5		Frame 6	
	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 3584 Specialist web interface (see "Changing the SCSI ID or Loop ID of a Drive or Control Port" on page 124). 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 (and AL_PA), the lower 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 25 on page 194.

Table 25. Valid Loop IDs and Their Associated AL_PAs for Ultrium Tape Drives in the 3584 UltraScalable Tape Library

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 *StorageSmart by IBM Ultrium External Tape Drive TX200, StorageSmart by IBM Ultrium Tape Drive Models T200 and T200F, and IBM 3580 Ultrium Tape Drive SCSI Reference* and the *3584 UltraScalable Tape Library 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 108 or “Changing a Control Path” on page 133).

World Wide Names

Each tape drive in the 3584 UltraScalable Tape Library is assigned an 8-byte World Wide Name that is unique to the drive. IBM Manufacturing assigns this name. It is used to generate a World Wide Node Name and a World Wide Port Name.

Connectors and Adapters

The 3584 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. Table 26 on page 196 provides a list of adapters that were compatible at the time of this book’s publication. To determine the latest attachments, visit the web at `http://www.ibm.com/storage/lto` or contact your IBM Sales Representative.

Table 26. Fibre Channel Adapters for Supported Servers

Server	Type of Adapter
IBM @server iSeries and AS/400	#2765 PCI Fibre Channel Tape Controller (with LC adapter)
IBM @server pSeries and RS/6000	#6227 Gigabit Fibre Channel Adapter, PCI
	#6228 Gigabit Fibre Channel Adapter, 64-bit, PCI
IBM @server xSeries and Netfinity®	QLogic QLA-2200F 64-bit PCI-to-Fibre Channel Adapter
	FAStT Host Adapter, part number 00N6881
Windows NT and Windows 2000	Emulex Light Pulse™ LP8000 Fibre Channel PCI Host Bus Adapter
	QLogic QLA-2200F 64-bit PCI-to-Fibre Channel Adapter
Sun SPARC (PCI)	Emulex Light Pulse™ LP8000 Fibre Channel PCI Host Bus Adapter
	QLogic QLA-2200F 64-bit PCI-to-Fibre Channel Adapter
Sun SPARC (PCI)	Emulex Light Pulse™ LP8000S Fibre Channel Host Bus Adapter

Connecting to the iSeries Server

Each tape drive that uses a Fibre Channel interface reports as a single target and one or two LUNs. Access to the SCSI Medium Changer device (the library control path) must be enabled for all Fibre Channel drives that are connected to @server iSeries servers. To enable control paths, see “Changing a Control Path” on page 133.

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 3584 UltraScalable Tape Library. The following information is for reference only.

Physical Characteristics of the SCSI Interface

The 3584 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 Ultra2 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 is still orderable for a limited time. For more information, see “Appendix E. Feature Codes” on page 239.

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 27 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 200.

Table 27. 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 199), 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. Table 28 on page 198 lists the types of SCSI buses and gives the recommended maximum quantity of drives that you can attach.

Table 28. Recommended Maximum Quantity of Drives Per SCSI Bus

Type of SCSI Bus	Drives with No Compression	Drives with 2:1 Compression
LTO Ultrium Ultra2 SCSI	4	2
LTO Ultrium Ultra SCSI	2	1
DLT Fast/Wide SCSI	3	2
Important: if you are using an IBM AS/400 or IBM @server iSeries, you can attach only one HVD Ultrium Tape Drive to the SCSI bus.		

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 29 lists the default SCSI IDs.

Table 29. Default SCSI ID for Each Drive or Control Port in the 3584 UltraScalable Tape Library

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 3584 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 124.

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 *StorageSmart by IBM Ultrium External Tape Drive TX200, StorageSmart by IBM Ultrium Tape Drive Models T200 and T200F, and IBM 3580 Ultrium Tape Drive SCSI Reference* and the *3584 UltraScalable Tape Library 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 108 or “Changing a Control Path” on page 133).

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 *3584 UltraScalable Tape Library SCSI Reference*.

Using Multiple SCSI Buses

The 3584 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 13.

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

When connecting the 3584 UltraScalable Tape Library to your host server, use the appropriate SCSI cables, connectors, and, if necessary, interposers. “Appendix E. Feature Codes” on page 239 lists the available cables. Table 30 lists the feature code of the connectors for the HD68 and VHDCI adapters. Each SCSI drive canister in the library uses the VHDCI connector. For each supported server, Table 31 on page 201 lists the type of connector for the adapter. The list features connectors that were compatible at the time of this book’s publication. To determine the latest attachments, visit the web at `http://www.ibm.com/storage/lto` or contact your IBM Sales Representative.

Note: 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 239.

Table 30. Connectors for HD68 and VHDCI Adapters

Type of Connection on Adapter	Feature Code for Type of Connection on Drive or Control Port	
	HD68	VHDCI
HD68	5305, 5310, 5318, 5325	5604, 5610, 5620, 5625
VHDCI	5604, 5610, 5620, 5625	5704, 5710, 5720, 5725

Table 31. SCSI Adapters for Supported Servers

Server	Type of Adapter	Type of Signaling System	Type of Connector on Adapter
IBM @server iSeries and AS/400	PCI Magnetic Media Controller (FC 2729) (see Note 1)	HVD	HD68
IBM @server iSeries and AS/400	PCI Ultra Magnetic Media Controller (FC 2749)	HVD	HD68
IBM @server iSeries and AS/400	Magnetic Media Subsystem Controller (FC 6501)	HVD	See Note 2
IBM @server iSeries and AS/400	Magnetic Media Controller (FC 6534)	HVD	HD68
IBM @server pSeries and RS/6000	PCI Universal Differential Ultra SCSI Adapter (FC 6204, identifier 4-U)	HVD	HD68
IBM @server pSeries and RS/6000	PCI Dual Channel Ultra2 SCSI (LVD/SE) Adapter (FC 6205, identifier 4-R)	LVD	VHDCI
IBM @server pSeries and RS/6000	PCI Differential Ultra SCSI Adapter (FC 6207)	HVD	HD68
IBM @server pSeries and RS/6000	Integrated Ultra2 SCSI Adapter	LVD	VHDCI
IBM @server xSeries and Netfinity	19K4646 PCI Wide Ultra160 SCSI Adapter	LVD	VHDCI
IBM @server xSeries and Netfinity	33L5000 Wide Ultra2 SCSI PCI Adapter	LVD	HD68
HP	A4800A Ultra Wide HVD SCSI Adapter (see Note 3)	HVD	HD68
HP	A5149A Ultra2 LVD Single-Port SCSI Adapter	LVD	VHDCI
HP	A5150A Ultra2 LVD Dual-Port SCSI Adapter	LVD	VHDCI
Sun SPARC (PCI)	X6541A HVD Ultra SCSI Adapter	HVD	VHDCI
Sun (Sbus)	X1065A HVD Ultra DWIS/S Host Adapter	HVD	HD68
Windows NT and Windows 2000	Adaptec SCSI Card 29160	LVD	HD68
Windows NT and Windows 2000	Adaptec SCSI Card 39160	LVD	VHDCI
Windows NT and Windows 2000	Adaptec AHA-2940U2W Ultra2/Wide LVD SCSI Adapter	LVD	HD68
Windows NT and Windows 2000	Adaptec AHA-2944UW PCI-to-Ultra Wide Differential SCSI Adapter	HVD	HD68
Windows NT and Windows 2000	LSI Logic SYM22910, 64-bit, PCI-to-Ultra2/SCSI Dual Channel Adapter	HVD	VHDCI

Notes:

1. *FC nnnn* represents the feature code of the server, where *FC* is the abbreviation for feature code and *nnnn* is the actual code.
2. Requires 6501 interposer, P/N 05H3834 (FC 2895).
3. When attached to V-Class systems, requires the Inline HVD SCSI Terminator, feature code 5098.

Notes on Connecting to the AS/400 and iSeries Servers

The following conditions apply to the SCSI bus attachment of the 3584 UltraScalable Tape Library to the IBM AS/400 and the IBM@server iSeries servers. (Feature codes in the following list are abbreviated as FC.)

- An interposer (FC 2895 for the 3584 UltraScalable Tape Library) is required to connect the 3584 UltraScalable Tape Library's tape drives to the Magnetic Media Subsystem Controller (FC 6501). 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) provides two ports, but one port must remain unused when connecting the 3584 UltraScalable Tape Library. Each port can support one or two of the 3584 UltraScalable Tape Library's tape drives, but only one is recommended for optimum performance.
- When the 3584 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), 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 3584 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 13).
- For the 3584 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 17).
- If you plan to use the 3584 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), or Magnetic Media Controller (FC 6534).

Chapter 9. Problem Determination

Use the information in this chapter to resolve possible problems with the 3584 UltraScalable Tape Library. The tables in this section list symptoms or errors that could occur and give the required corrective actions. Table 32 applies to errors that occur when you are using the library's operator panel. To resolve errors that occur when you are using the library's web interface, refer to the *IBM 3584 UltraScalable Tape Library Maintenance Information* manual.

The library removes the error message from the touchscreen when you press MENU.

Table 32. Resolving Errors with the 3584 UltraScalable Tape Library. Use this table when you are using the operator panel to operate the library.

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 |). 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 72 and "Inserting a Cleaning Cartridge into the Library" on page 68. To order cleaning cartridges, see "Ordering Media Supplies" on page 174.
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 68. 2. Ensure that automatic cleaning is set correctly. To enable automatic cleaning, see "Enabling or Disabling Automatic Cleaning" on page 74. 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 76).
An error message displays on the touchscreen.	1. Record the error message, as well as any error codes, locations, and so forth. 2. Call your IBM Service Representative.

Table 32. Resolving Errors with the 3584 UltraScalable Tape Library (continued). Use this table when you are using the operator panel to operate the library.

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 193). 3. Ensure that all Fibre Channel host adapters are supported (refer to Table 26 on page 196). 4. Ensure that the appropriate levels of device driver are installed and that any other prerequisites are satisfied (see “Supported Device Drivers” on page 6). 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 “World Wide Names” on page 195). 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 32. Resolving Errors with the 3584 UltraScalable Tape Library (continued). Use this table when you are using the operator panel to operate the library.

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 198). **Note:** Unless an RS/600 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 204. b. Ensure that the host is configured with the correct Loop ID or AL_PA (see “Fibre Channel Addressing” on page 193). 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 32. Resolving Errors with the 3584 UltraScalable Tape Library (continued). Use this table when you are using the operator panel to operate the library.

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 166; for DLT cartridges, see “Setting the Write-Protect Switch” on page 186). 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 164; for DLT cartridges, see “Bar Code Label” on page 180). 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 91). 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 Cartridges from the Library” on page 65). • If the retry with a different cartridge fails, call your IBM Service Representative.

Table 32. Resolving Errors with the 3584 UltraScalable Tape Library (continued). Use this table when you are using the operator panel to operate the library.

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 working, 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`	

Appendix A. Library Capacity

Table 33 lists 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 table also gives the native and compressed capacity for each type of configuration.

Capacity for Models L32, D32, and D42

Table 33. Quantity of Storage Slots and Capacity for Ultrium Tape Cartridges in Model L32 Base Frame and Model D32 and D42 Expansion Frames. 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	14.1	28.2	229	22.9	45.8	281	28.1	56.2
5-8	113	11.3	22.6	201	20.1	40.2	253	25.3	50.6
9-12	87	8.7	17.4	175	17.5	35.0	227	22.7	45.4

Drives in Model D32 Frame	Slots in Model D32 Frame		
	Quantity	Native Capacity (in TB)	2:1 Comp. Capacity (in TB)
0	440	44.0	88.0
1-4	423	42.3	84.6
5-8	409	40.9	81.8
9-12	396	39.6	79.2

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 50 shows the technical components of the IBM 3584 UltraScalable Tape Library. The sections that follow describe each component.

1	Rail assembly	7	Medium Changer card pack
2	Cartridge accessor	8	Power supplies
3	Dual-gripper transport mechanism	9	Frame control box (FCB)
4	Accessor controller	10	AC outlets
5	Operator panel controller	11	Circuit breakers
6	Frame control assembly	12	Incoming main AC power

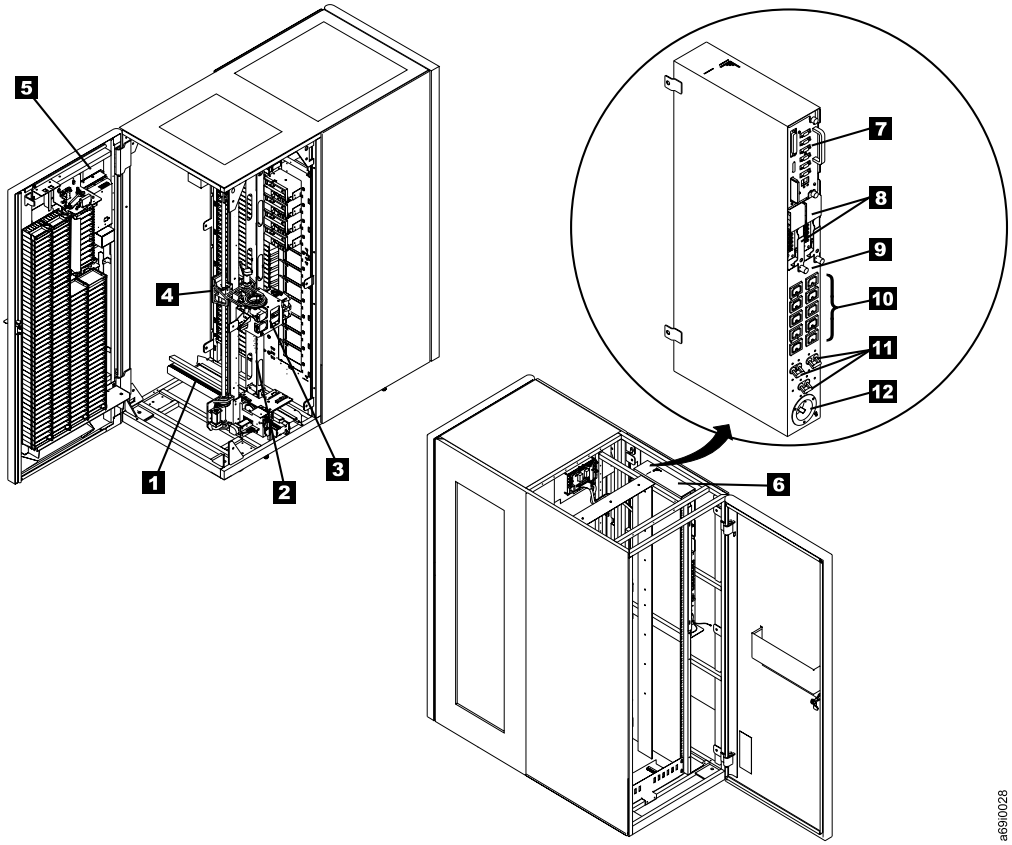


Figure 50. Technical Components of the 3584 UltraScalable Tape Library

Rail Assembly

The cartridge accessor moves through the library on a rail assembly (**1** in Figure 50 on page 211). 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 50 on page 211) 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).

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 50 on page 211).

In libraries that use mixed media, 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 50 on page 211) 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 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.

The CAN also facilitates communication between the accessor controller and the X-axis and Y-axis controllers.

Operator Panel Controller

The operator panel controller (see **5** in Figure 50 on page 211) 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 and all Medium Changer card packs via the Controller Area Network (CAN).

Frame Control Assembly

Located at the right rear of the 3584 UltraScalable Tape Library, the frame control assembly (FCA) (see **6** in Figure 50 on page 211) 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 3584 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 50 on page 211).

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 50 on page 211).

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 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 51 shows an MCP with a 10/100 Mbs Ethernet port.

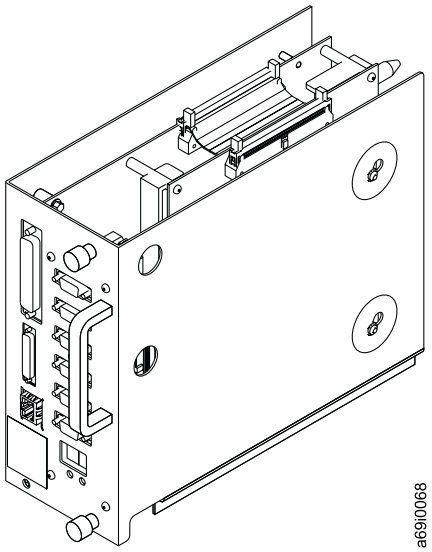


Figure 51. MCP With 10/100 Ethernet Port

Drive and Power Supply Compartment

The 3584 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. This 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 52 shows the rear of the 3584 Tape Library and the compartment that contains the tape drives, control ports, and power supplies.

1	Control port canister	6	Redundant 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		

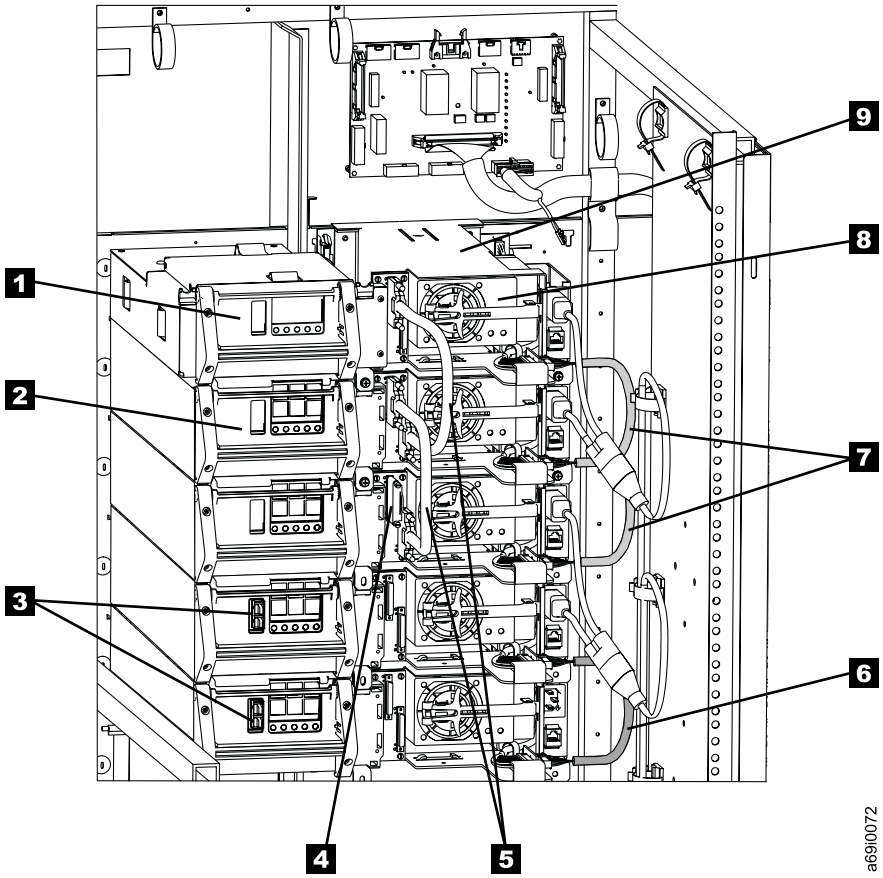


Figure 52. Compartment that Houses the Tape Drives, Control Ports, and the Power Supplies. The view is from the rear of the 3584 Tape Library. The left side of the library has been removed.

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	Ultrium Tape Drive
FC-AL	Fibre Channel Arbitrated Loop
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 239.

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 34 on page 217 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 34. 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

Appendix C. TapeAlert Flags

TapeAlert is a standard that defines various status conditions and problems experienced by such devices as tape drives, tape autoloaders, and tape libraries. The standard enables a host to read TapeAlert flags from a tape drive via the SCSI bus. The host reads the flags from Log Sense Page 0x2E. This appendix lists TapeAlert flags that are supported by the Ultrium Tape Drive, the DLT 8000 Tape System, and the 3584 UltraScalable Tape Library.

TapeAlert Flags Supported by the Ultrium Tape Drive

TapeAlert Flags Supported by the Ultrium Tape Drive			
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, 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.
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.

TapeAlert Flags Supported by the Ultrium Tape Drive			
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 166).
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.
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.
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	If Flag Number 4 is also set, the problem could be caused by defective media. Replace the cartridge. If Flag Number 4 is not 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.
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 data from the tape to rebuild the tape directory.
19	Nearing media life	Set when you load a cartridge that is nearing its specified end of life (that is, the number of expected passes will soon be exceeded).	Replace the tape cartridge.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive.
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive. See "Cleaning a Tape Drive" on page 74.
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 which requires that you reset the tape drive to recover.	Contact your IBM Service Representative.

TapeAlert Flags Supported by the Ultrium Tape Drive			
Flag Number	**Flag**	**Description**	**Action Required**
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.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive and discard it.	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 via the SCSI interface.	Download the FMR image again (ensure that it is the correct image).
36	Drive temperature	Set when the drive temperature sensor indicates that the drive is too hot.	Ensure that the operating temperature is within the specified range (see “Environmental Specifications” on page 31). If the operating temperature is within the specified range, contact your IBM Service Representative to replace the tape drive.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are outside of the specified voltage limits.	Contact your IBM Service Representative.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	Contact your IBM Service Representative.

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 166).
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 IBM 3584 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.
13	Library pick retry	The operation to pick a cartridge had to perform an excessive number of retries before succeeding.	1. No action needs to be take at this time. 2. If the problem persists, call your IBM Service Representative.
14	Library place retry	The operation to place a cartridge had to perform an excessive number of retries before succeeding.	1. No action needs to be take at this time. 2. If the problem persists, call your IBM Service Representative.
15	Library load retry	The operation to load a cartridge into a drive had to perform an excessive number of retries before succeeding.	1. No action needs to be take at this time. 2. If the problem persists, 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.

TapeAlert Flags Supported by the IBM 3584 UltraScalable Tape Library			
Flag Number	**Flag**	**Description**	**Action Required**
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 3584 UltraScalable Tape Library, 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

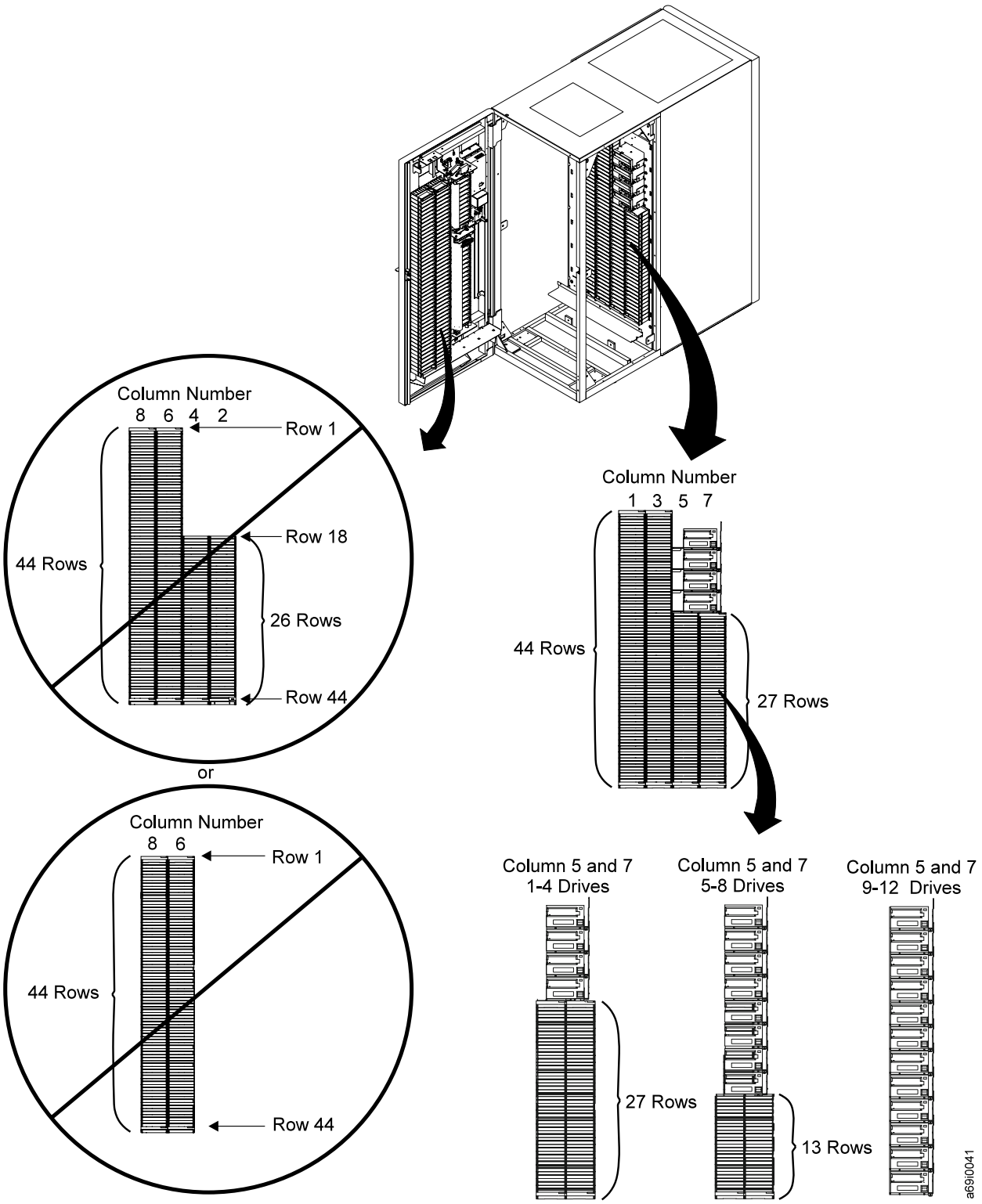


Figure 53. Location of Storage Elements in Model L32 without the Capacity Expansion Feature. The storage slots on the door are unavailable.

Table 35. 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

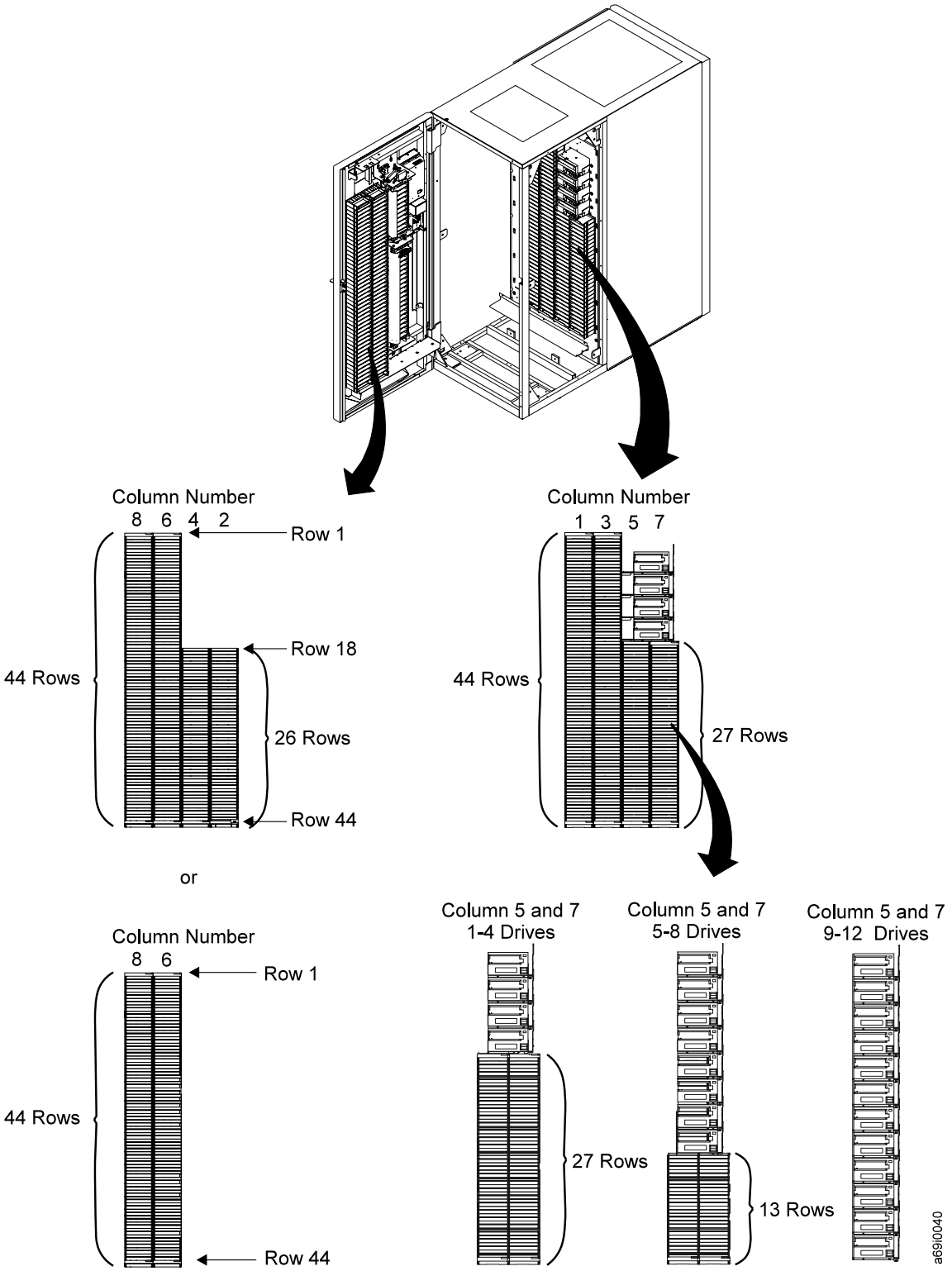


Figure 54. Location of Storage Elements in Model L32 with the Capacity Expansion Feature. The storage slots on the door are available.

Table 36. 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 37. 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

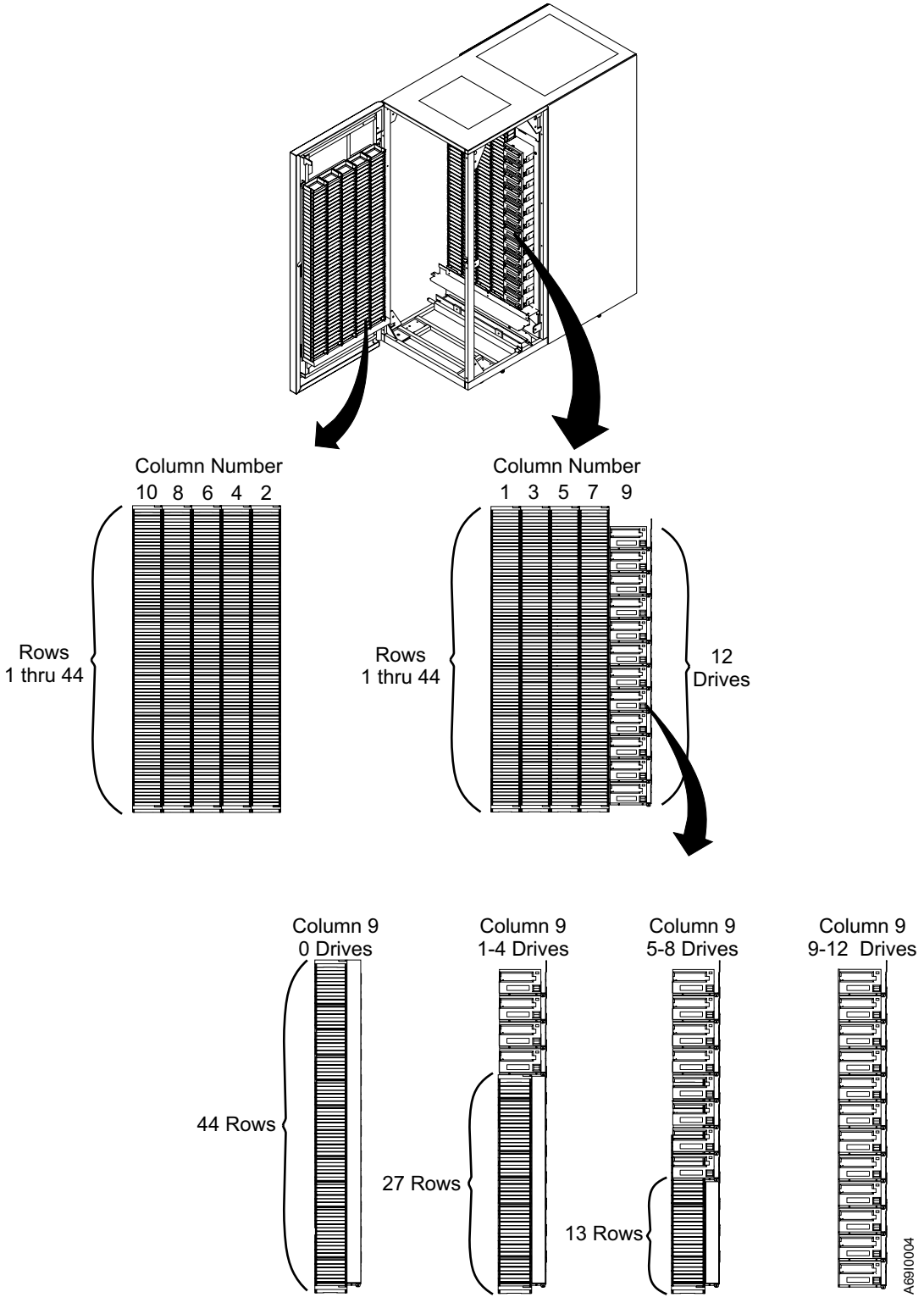


Figure 55. Location of Storage Elements in Model D32

Table 38. 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

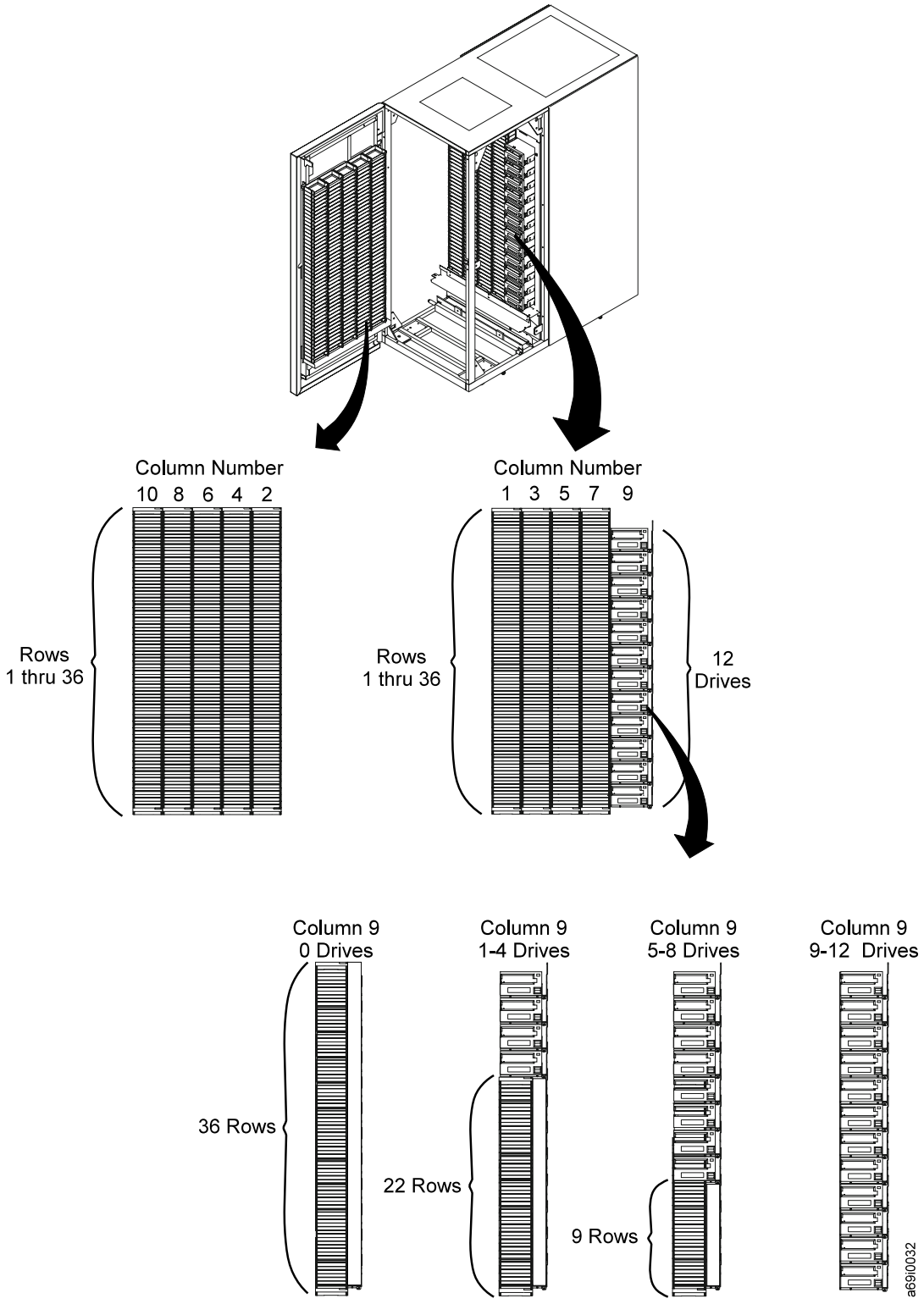


Figure 56. Storage Elements in Model D42

Table 39. 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: If the Model D42 is the first frame in a library that contains both LTO and DLT media, 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 57 on page 237 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').

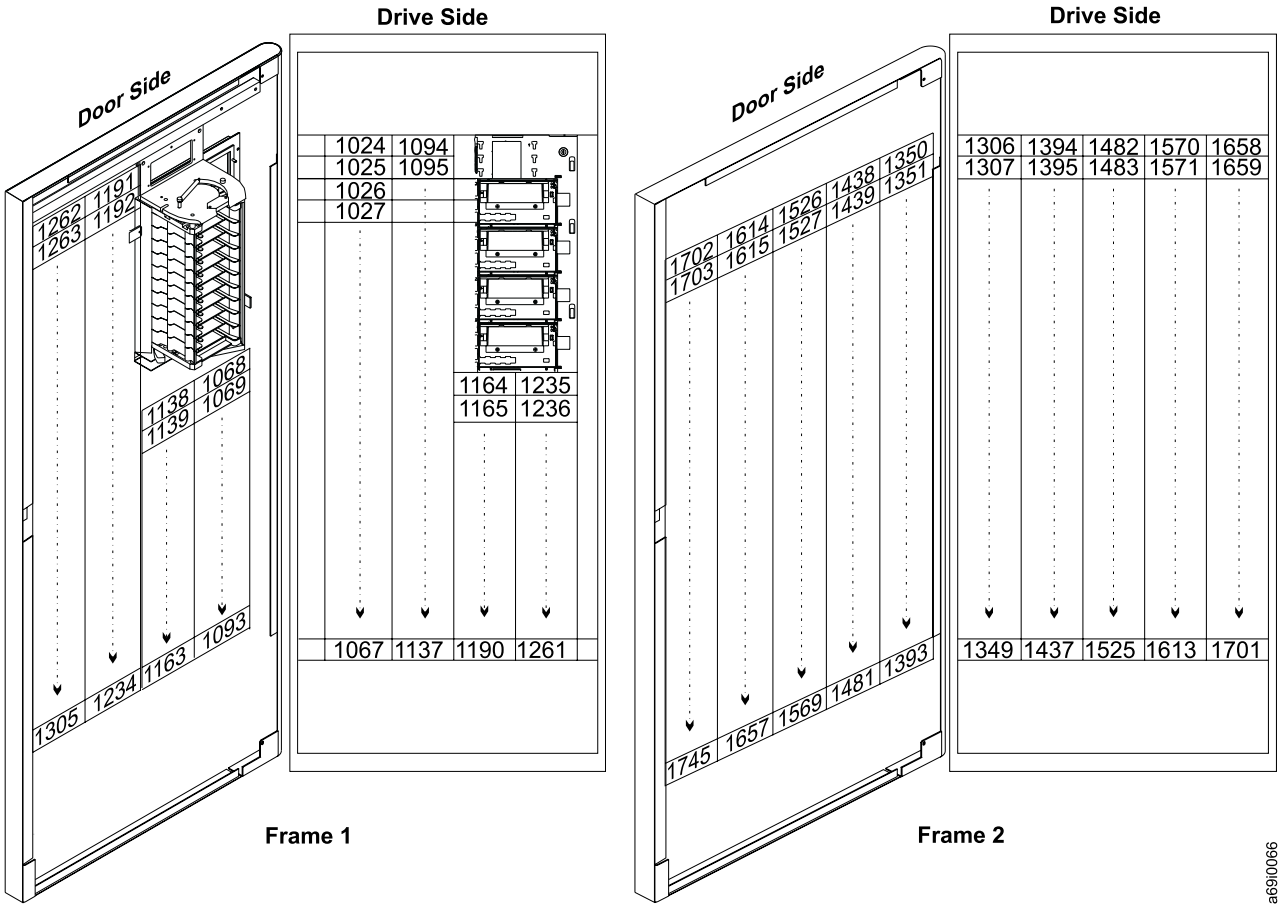


Figure 57. Assigning SCSI StE Addresses to Storage Slots. The example shows two LTO frames, each with their front doors open. When assigning StE addresses, the library ignores the I/O stations and drives, and assigns the addresses to the slots beneath them.

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 40 lists the SCSI addresses for the DTEs.

Table 40. SCSI Data Transfer Element (DTE) Addresses for Tape Drives

SCSI DTE Addresses for Tape Drives						
	Frame 1	**Frame 2**	**Frame 3**	**Frame 4**	**Frame 5**	**Frame 6**
Row 1	257(X'101')	269(X'10D')	281(X'119')	293(X'125')	305(X'131')	317(X'13D')
Row 2	258(X'102')	270(X'10E')	282(X'11A')	294(X'126')	306(X'132')	318(X'13E')
Row 3	259(X'103')	271(X'10F')	283(X'11B')	295(X'127')	307(X'133')	319(X'13F')
Row 4	260(X'104')	272(X'110')	284(X'11C')	296(X'128')	308(X'134')	320(X'140')
Row 5	261(X'105')	273(X'111')	285(X'11D')	297(X'129')	309(X'135')	321(X'141')
Row 6	262(X'106')	274(X'112')	286(X'11E')	298(X'12A')	310(X'136')	322(X'142')
Row 7	263(X'107')	275(X'113')	287(X'11F')	299(X'12B')	311(X'137')	323(X'143')
Row 8	264(X'108')	276(X'114')	288(X'120')	300(X'12C')	312(X'138')	324(X'144')
Row 9	265(X'109')	277(X'115')	289(X'121')	301(X'12D')	313(X'139')	325(X'145')
Row 10	266(X'110')	278(X'116')	290(X'122')	302(X'12E')	314(X'13A')	326(X'146')
Row 11	267(X'111')	279(X'117')	291(X'123')	303(X'12F')	315(X'13B')	327(X'147')
Row 12	268(X'10C')	280(X'118')	292(X'123')	304(X'130')	316(X'13C')	328(X'148')
Note: Addresses are given in decimal and hexadecimal format.						

Appendix E. Feature Codes

When ordering the 3584 UltraScalable Tape Library, 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 3584 UltraScalable Tape Library:

- Table 41 lists the feature codes for Model L32
- Table 42 lists the feature codes for Model D32
- Table 43 lists the feature codes for Model D42

Feature Codes for Model L32 (Base Frame)

Table 41. Feature Codes for Model L32 of the 3584 UltraScalable Tape Library

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 HD68 LVD drive on tray (see Note 1)
1465	LTO Ultrium HD68 HVD drive on tray (see Note 1)
1466	LTO Ultrium FC-AL drive on tray (see Note 2)
1603	Capacity expansion feature (field installation)
1607	Mixed media/Model D42 support
1653	Capacity expansion feature (plant installation)
1657	20 additional LTO I/O slots
1660	10/100 Ethernet support (field only; see Note 3)
1662	3584 Specialist support
1663	Drive removal
1664	Patch panel removal
1665	Drive install, 1663/1454 (see Note 4)
1666	Drive install, 1663/1455 (see Note 4)
1667	Drive install, 1663/1456 (see Note 4)
1670	Drive install, 1664/1462 (see Note 5)
1671	Drive install, 1663/1464 (see Note 6)
1672	Drive install, 1663/1465 (see Note 7)
1673	Drive install, 1663/1466 (see Note 8)

Table 41. Feature Codes for Model L32 of the 3584 UltraScalable Tape Library (continued)

Feature Code	Description
2710	Remote Support Facility
2711	Remote Support switch
2712	Remote Support attachment
2895	Interposer, IBM @server 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)
8750	IBM LTO Ultrium Cleaning Cartridge
8757	IBM LTO Ultrium Data Cartridge, 20-pack, unlabeled
9002	First expansion frame attachment
9003	Additional expansion frame attachment
9007	Mixed LTO/DLT media support
9210	Attached to HP-UX system
9211	Attached to Sun system
9212	Attached to Windows system
9213	Attached to other non-IBM system
9400	Attached to IBM @server iSeries or AS/400 server
9600	Attached to IBM @server pSeries or RS/6000 server
9660	10/100 Ethernet support (mandatory and plant only; see Note)

Table 41. Feature Codes for Model L32 of the 3584 UltraScalable Tape Library (continued)

Feature Code	Description
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 Vac 30 A with Hubbell twistlock, non-watertight connector (available only in the U. S. and Canada, and available only at time of order)

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. Remote 10/100 Ethernet support (feature code 9660) is required with all new orders.
4. Feature codes 1665, 1666, or 1667 provide installation of a customer-provided LTO Ultrium HVD Drive canister (previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1454, 1455, or 1456 (respectively) is installed in the library.
5. Feature code 1670 provides installation of a customer-provided Fibre Channel patch panel (previously removed by feature code 1664) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1462 is installed in the library.
6. Feature code 1671 provides installation of a customer-provided LTO Ultrium HD68 LVD Drive on Tray (formerly known as an LTO Ultrium LVD Drive Sled and previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1464 is installed in the library.
7. Feature code 1672 provides installation of a customer-provided LTO Ultrium HD68 HVD Drive on Tray (formerly known as an LTO Ultrium HVD Drive Sled and previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1465 is installed in the library.
8. Feature code 1673 provides installation of a customer-provided LTO Ultrium FC-AL Drive on Tray (previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1466 is installed in the library.

Feature Codes for Model D32 (Expansion Frame)

Table 42. Feature Codes for Model D32 of the 3584 UltraScalable Tape Library

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
1663	Drive removal
1664	Patch panel removal
1665	Drive install, 1663/1454 (see Note 3)
1666	Drive install, 1663/1455 (see Note 3)
1667	Drive install, 1663/1456 (see Note 3)
1670	Drive install, 1664/1462 (see Note 4)
1671	Drive install, 1663/1464 (see Note 5)
1672	Drive install, 1663/1465 (see Note 6)
1673	Drive install, 1663/1466 (see Note 7)
2895	Interposer, IBM @server 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)
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)

Table 42. Feature Codes for Model D32 of the 3584 UltraScalable Tape Library (continued)

Feature Code	Description
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)
8750	IBM LTO Ultrium Cleaning Cartridge
8757	IBM LTO Ultrium Data Cartridge, 20-pack, unlabeled
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
9400	Attached to IBM @server iSeries or AS/400 server
9600	Attached to IBM @server pSeries or RS/6000 server
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 Vac 30 A with Hubbell twistlock, non-watertight connector (available only in the U. S. and Canada, and available only at time of order)

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. Feature codes 1665, 1666, or 1667 provide installation of a customer-provided LTO Ultrium HVD Drive canister (previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1454, 1455, or 1456 (respectively) is installed in the library.
4. Feature code 1670 provides installation of a customer-provided Fibre Channel patch panel (previously removed by feature code 1664) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1462 is installed in the library.
5. Feature code 1671 provides installation of a customer-provided LTO Ultrium HD68 LVD Drive on Tray (formerly known as an LTO Ultrium LVD Drive Sled and previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1464 is installed in the library.
6. Feature code 1672 provides installation of a customer-provided LTO Ultrium HD68 HVD Drive on Tray (formerly known as an LTO Ultrium HVD Drive Sled and previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1465 is installed in the library.
7. Feature code 1673 provides installation of a customer-provided LTO Ultrium FC-AL Drive on Tray (previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1466 is installed in the library.

Feature Codes for Model D42 (Expansion Frame)

Table 43. Feature Codes for Model D42 of the 3584 UltraScalable Tape Library

Feature Code	Description
1452	Frame control assembly
1458	DLT 8000 LVD drive canister
1459	DLT 8000 HVD drive canister
1605	Additional LVD library control port
1606	Additional HVD library control port
1663	Drive removal
1668	Drive install, 1663/1458 (see Note 1)
1669	Drive install, 1663/1459 (see Note 2)
5098	Inline HVD SCSI terminator
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
8759	DLTtape IV Data Cartridge, 21-pack, unlabeled
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 @server® pSeries or RS/6000 server
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 Vac 30 A with Hubbell twistlock, non-watertight connector (available only in the U. S. and Canada, and available only at time of order)

Notes:

1. Feature code 1668 provides installation of a customer-provided DLT 8000 LVD Drive canister (previously removed by feature code 1663) into an existing 3584 UltraScalable Tape Library. After installation, Machine Level Control records are updated to indicate that feature code 1458 is installed in the library.
2. Feature code 1669 provides installation of a customer-provided DLT 8000 HVD Drive canister (previously removed by feature code 1663) into an existing 3584 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

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

Machine: IBM 3584 UltraScalable Tape Library

Warranty Period*: 1 year

**Contact your place of purchase for warranty service information. Some IBM Machines are eligible for On-site warranty service, depending on the country where service is performed.*

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.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller is unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded. The replacement may not be new, but will be in good working order.

Extent of Warranty

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration by Machine or parts identification labels.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Items Not Covered by Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

Unless specified otherwise, IBM provides non-IBM machines **WITHOUT WARRANTIES OF ANY KIND**.

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine setup and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND**.

To obtain warranty service for the Machine, contact your reseller or IBM. In the United States, call IBM at **1-800-IBM-SERV (426-7378)**. In Canada, call IBM at **1-800-465-6666**. You may be required to present proof of purchase.

IBM or your reseller provides certain types of repair and exchange service, either at your location or at a service center, to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. IBM may repair the failing Machine or exchange it at its discretion.

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.

Any feature, conversion, or upgrade IBM or your reseller services must be installed on a Machine which is 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to:

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
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
   d. inform IBM or your reseller of changes in a Machine’s location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM’s possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary, or personal information contained in a Machine which you returned to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Production Status

Each IBM Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's appropriate warranty terms apply.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you were entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the greater of US $100,000 (or equivalent in local currency) or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

This limit also applies to IBM's supplier and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM, ITS SUPPLIERS, OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Appendix G. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions; therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM web sites are provided for convenience only and do not in any manner serve as an endorsement of those web sites. The materials at those web sites are not part of the materials for this IBM product and use of those web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements, or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current, and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

If you are viewing this information in softcopy, the photographs and color illustrations may not appear.

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically by using these addresses:

- Internet: starpubs@vnet.ibm.com (or starpubs at vnet.ibm.com)
- IBMLink from U.S.A.: STARPUBS at SJEVM5
- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3VVD at IBMMAIL
- Fax from U.S.A. and Canada: 520-799-2906

You can also mail your comments to:

IBM Corporation
Information Development
Department GZW
9000 South Rita Road
Tucson, AZ 85775-4401, U.S.A.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States or other countries or both:

- ADSTAR
- AIX
- AS/400
- @server
- IBM
- IBMLink
- Micro Channel
- Netfinity
- OS/400
- RISC System/6000
- RS/6000
- StorageSmart

Tivoli is a registered trademark of Tivoli Systems, Inc. in the United States, or other countries, or both.

The following are U. S. trademarks of Hewlett-Packard Company, International Business Machines Corporation, and Seagate Technology:

- Linear Tape-Open
- LTO
- Ultrium Tape Drive

Intel is a registered trademark of Intel Corporation in the United States, or other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are registered trademarks of Microsoft Corporation in the United States, or other countries, or both.

Solaris and Sun are registered trademarks of Sun Microsystems Incorporated.

Other company, product, and service names may be trademarks or service marks of others.

Electronic Emission Notices

The following statement applies to this IBM product. The statement for other IBM products intended for use with this product will appear in their accompanying manuals.

IBM 3584 UltraScalable Tape Library

Federal Communications Commission (FCC) Class A Statement

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.

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.

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.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (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.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2: Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: ″Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.″

EN 50082-1 Hinweis: ″Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern.″

Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den IBM Handbüchern angegeben zu installieren und zu betreiben.

Japan VCCI Class A ITE Electronic Emission Statement

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 vcci

Taiwan Class A Electronic Emission Statement

警告使用者:
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。 taiemi

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.

2x. In measuring clearances for the tape library, a designator that indicates that a measurement applies to two analogous sides.

3584 UltraScalable Tape Library. A device that can be attached to a supported server and used to write data to and from magnetic tape. The 3584 UltraScalable Tape Library can include up to 6 frames and 72 drives. For Ultrium Tape Drives, the maximum data capacity is 496.2 TB and maximum aggregate data transfer rate is 7.8 TB per hour (both 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 3584 UltraScalable Tape Library for normal operation.

Activity screen. The primary screen on the 3584 UltraScalable Tape Library's touchscreen. The Activity screen gives the level of firmware in the library, shows whether the library is online or offline, 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 3584 UltraScalable Tape Library, units that can contain tape cartridges and that are recognizable to the library by both a physical address (such as F1-C5-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 3584 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 3584 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 3584 Specialist web interface.

automatic inventory. A survey of the location of cartridges in the 3584 UltraScalable Tape Library. The library performs the survey at power-on or whenever the front door of any frame is opened 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.

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 3584 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 3584 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 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.

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 3584 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 3584 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 3584 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 3584 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 3584 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 3584 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 3584 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 3584 UltraScalable Tape Library.

cell top cap. Located on each column of storage slots within the 3584 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 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 3584 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 3584 UltraScalable Tape Library to manage communication to and from a server and the library.

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 3584 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 3584 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 3584 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 3584 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 3584 UltraScalable Tape LibraryUltraScalable 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 3584 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 3584 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 3584 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

head. See *drive head*.

heat output. The amount of heat (in kBtu/hr) that the 3584 UltraScalable Tape Library dissipates during normal operation.

hertz (Hz). A unit of frequency equal to one 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 Voltage Differential (HVD). A logic signaling system that enables data communication between a supported server and the 3584 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 3584 UltraScalable Tape Library Specialist web interface. A platform-independent, web-based interface that allows a user to configure and monitor the 3584 UltraScalable Tape Library from a remote location.

IBM Ultrium Tape Drive. Located within the 3584 UltraScalable Tape Library, 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. The drive is the first of four drives planned for the Ultrium format. Its native data capacity is 100 GB per cartridge; with 2:1 compression, its capacity is up to 200 GB.

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.

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.

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 3584 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 3584 UltraScalable Tape Library when the ac line voltage is first applied.

insert. Pertaining to the 3584 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.

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 3584 UltraScalable Tape Library, one of four screw-operated jacks for raising or lowering the library.

library frame. The basic unit of the 3584 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 3584 UltraScalable Tape Library, a toggle switch that enables you to turn the power to the library on and off.

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 3584 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 3584 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 3584 UltraScalable Tape Library by their location or count. The 3584 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 3584 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 3584 UltraScalable Tape Library so that its robotics are shared by homogenous (similar) and heterogeneous (dissimilar) servers. The 3584 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 3584 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 3584 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.

manual cleaning. A method by which an operator selects a menu option from the 3584 UltraScalable Tape Library's touchscreen or 3584 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 3584 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 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 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 3584 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.

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).

mid-range systems. A set of multi-user servers with a hard disk capacity of between 50 GB and 250 GB.

mixed media. The concept of using both LTO Ultrium Tape Cartridges and DLT Tape Cartridges in the 3584 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 3584 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 3584 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 F1,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). Non-addessable cartridge storage slots do not have SCSI element addresses. There are no non-addessable slots in the Model D32 expansion frame.

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.

offline. The operating condition that the 3584 UltraScalable Tape Library is in when the host applications cannot interact with it. For example, when the front door is open.

online. The operating condition that the 3584 UltraScalable Tape Library is in when the host applications can interact with it.

operating environment. The temperature, relative humidity rate, and wet bulb temperature of the room in which the 3584 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 contains buttons to control the tape library. The unit's LCD touchscreen provides information about the operation of the 3584 UltraScalable Tape Library, and one or two I/O stations for inserting and removing cartridges.

operator panel controller. Within the 3584 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 3584 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 3584 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 3584 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 3584 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 3584 UltraScalable Tape Library, to place, by means of a robotic device, a tape cartridge into a storage slot or drive.

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 3584 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.

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 3584 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 3584 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 3584 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 3584 UltraScalable Tape Library to the SCSI interface. This logical address is represented on the operator panel or 3584 Specialist web interface as `xxxx(yyyh)`, where `xxxx` is a decimal value and `yyyh` is a hexadecimal value. It is assigned 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) 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 @server pSeries, IBM @server iSeries, HP, and Sun are servers. Synonymous with *host*.

service clearance. Surrounding the 3584 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 3584 UltraScalable Tape Library.

shipping environment. The temperature, relative humidity rate, and wet bulb temperature of the environment to which the 3584 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.

single-phase power. Pertaining to the 3584 UltraScalable Tape Library, electricity that is transmitted via three wires (line, neutral, and ground), with a line-to-neutral voltage of 200-240 Vac.

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.

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 3584 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.

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 3584 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 whenever you press it.

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.

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 3584 UltraScalable Tape Library, electricity that is transmitted via three wires (line, line, and ground), with a line-to-line voltage of 200-240 Vac. Sometimes referred to as *single phase power*.

U

Ultra SCSI. See *Small Computer Systems Interface*.

Ultra-2 SCSI. See *Small Computer Systems Interface*.

ultrascalable. Pertaining to the 3584 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 3584 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

Vac. Volts ac (alternating current).

vital product data (VPD). Pertaining to the 3584 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 3584 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.

Index

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

X

Y

Z

Readers' Comments — We'd Like to Hear from You

3584 UltraScalable Tape Library
Planning and Operator Guide

Publication No. GA32-0408-03

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	☐	☐	☐	☐	☐

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	☐	☐	☐	☐	☐
Complete	☐	☐	☐	☐	☐
Easy to find	☐	☐	☐	☐	☐
Easy to understand	☐	☐	☐	☐	☐
Well organized	☐	☐	☐	☐	☐
Applicable to your tasks	☐	☐	☐	☐	☐

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? ☐ Yes ☐ No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name _____ Address _____

Company or Organization _____

Phone No. _____

Readers' Comments — We'd Like to Hear from You
GA32-0408-03

Cut or Fold
Along Line

Fold and Tape | **Please do not staple** | Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation
Department GZW
9000 South Rita Road
Tucson, AZ U.S.A. 85775-4401

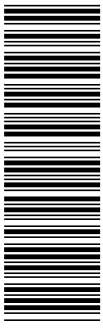
Fold and Tape | **Please do not staple** | Fold and Tape

GA32-0408-03

Cut or Fold
Along Line

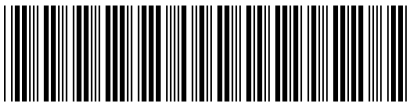
Part Number: 19P0401

Printed in the United States of America
on recycled paper containing 10%
recovered post-consumer fiber.



(1P) P/N: 19P0401

GA32-0408-03



Spine information:

3584 UltraScalable Tape Library

3584 UltraScalable Tape Library Planning and Operator Guide