IBM TotalStorage
Ultrium Scalable Tape Library 3583

Setup and Operator Guide

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IBM

Setup and Operator Guide

> **Note!**
>
> Before using this information and the product it supports, read the information in "Safety and Environmental Notices" on page xix and "Notices" on page 329.
>
> To ensure that you have the latest publications, visit the web at `http://www.ibm.com/storage/lto`.

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Safety and Environmental Notices

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

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

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

Danger Notice

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

DANGER

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

Caution Notice

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

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

If the symbol is...	It means....
⚠ > 18 kg (40 lb)	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 server, 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 IBM TotalStorage Ultrium Scalable Tape Library 3583 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 IBM TotalStorage Ultrium Scalable Tape Library 3583.

Laser Safety and Compliance

Before using the IBM TotalStorage Ultrium Scalable Tape Library 3583, review the following laser safety information.

Class I Laser Product

The IBM TotalStorage Ultrium Scalable Tape Library 3583 may contain 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. The library has the necessary protective housing and scanning safeguards to 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.

Protective Devices

The IBM TotalStorage Ultrium Scalable Tape Library 3583 has the following protective devices:

- Monitored access to the library
- Main power switch

The sections that follow describe each type of protection.

Monitored Access to the Library

The IBM TotalStorage Ultrium Scalable Tape Library 3583 is completely surrounded by an enclosure. The library can be accessed only through monitored access areas.

The enclosure around the library separates the danger area of the library from the normal working area. The danger area is the area in which personnel can be injured by component movements.

CAUTION:
Movements of mechanical components in the library can cause serious injury. Access to the library should be restricted to authorized personnel only.

Mechanical Lock

The library's front door can be opened only with a key from the outside. Authorized personnel are responsible for the security of the key.

Main Power Switch

To turn on the power to the IBM TotalStorage Ultrium Scalable Tape Library 3583, press | on the main power switch (see **1** in Figure 1). To turn off the power, press 0 on the switch. In case of danger to personnel or property, immediately turn off the main power switch.
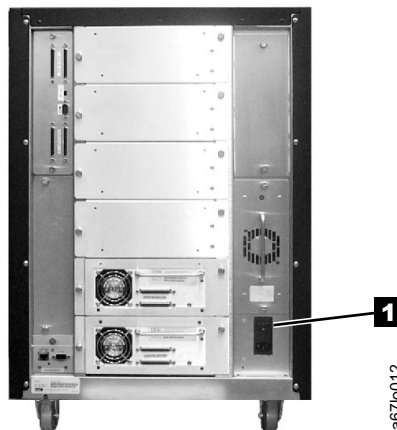
Figure 1. Main power switch on the IBM TotalStorage Ultrium Scalable Tape Library 3583. The switch is located at the rear of the library.

CAUTION:
To completely remove all power, disconnect the line cord from the electrical outlet.

Attention: Except in emergencies, stop the library with the normal shutdown procedure before you switch off the main power switch. IBM is not responsible for damage caused by improper use of the main power switch. Such risk lies entirely with the user.

CAUTION:
Movements of mechanical components in the tape library can cause serious injury. Before turning the main power switch on and restarting the tape library, confirm that no danger exists to personnel or property.

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. For more information, contact your IBM representative.

Preface

This guide contains information and instructions necessary for the installation and operation of the IBM TotalStorage Ultrium Scalable Tape Library 3583. It is intended for operators, trained customer specialists, and any service partner's maintenance personnel.

This guide includes the following chapters:

Chapter 1, "Introduction", on page 1 gives general information about the Ultrium Scalable Tape Library components.

Chapter 2, "Installation", on page 31 provides instructions for installing the Ultrium Scalable Tape Library in stand-alone and rack-mounted configurations.

Chapter 3, "Operator Panel and RMU", on page 79 describes the functional startup and shutdown operations of the Ultrium Scalable Tape Library.

Chapter 4, "Operating Procedures", on page 91 describes the visual menus and commands that the Ultrium Scalable Tape Library executes.

Chapter 5, "Using the Media", on page 245 describes how to handle tape cartridges, and the types of media the Ultrium Scalable Tape Library uses.

Chapter 6, "Using the Fibre Channel Interface", on page 267 describes the requirements of the Fibre Channel interface, discusses the address scheme for the Fibre Channel tape drives, discusses the role of World Wide Names, and provides information about connectors and adapters.

Chapter 7, "Using the SCSI Interface", on page 273 describes the requirements of the Small Computer Systems Interface (SCSI), and provides information about SCSI cables, connectors, interposers, and adapters.

Appendix A, "Removing a Tape Cartridge", on page 279 provides information for manually removing a tape cartridge from the Ultrium Scalable Tape Library.

Appendix B, "Element Addressing", on page 285 provides element addressing information for the Ultrium Scalable Tape Library.

Appendix C, "TapeAlert Flags", on page 293 lists TapeAlert flags that the Ultrium Tape Drive and the Ultrium Scalable Tape Library support.

Appendix D, "Error Messages", on page 297 includes a list of service action codes (SACs), operator intervention messages, and drive error codes.

Appendix E, "Feature Codes", on page 323 lists the codes that you need when ordering features for the Ultrium Scalable Tape Library.

Appendix F, "Power Cords", on page 325 provides power cord information for different countries or regions.

Related Publications

Refer to the following publications for additional information. To ensure that you have the latest publications, visit the web at `http://www.ibm.com/storage/lto`.

- *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*, SA37-0425, provides service and maintenance information for the tape library.
- *IBM TotalStorage Ultrium Scalable Tape Library 3583 SCSI Reference*, GA32-0454, provides the supported SCSI commands and protocol that govern the behavior of the SCSI interface for the tape library.
- *IBM TotalStorage Ultrium Scalable Tape Library 3583 Quick Reference*, GX35-0557, illustrates how to install and operate the tape library.
- *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*, GA32-0436, provides installation, operation, and service information for the SAN Data Gateway Module.
- *IBM Externally Attached Devices Safety Information*, SA26-2004, provides translations of danger and caution notices.
- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430, provides instructions for attaching IBM-supported hardware to open-systems operating systems. It indicates what devices and levels of operating systems are supported, gives requirements for adapter cards, and tells how to configure servers to use the device driver with the Ultrium family of devices.
- *IBM Ultrium Device Drivers Programming Reference*, GC35-0483, supplies information to application owners who want to integrate their open-systems applications with IBM-supported Ultrium hardware. The reference contains information about the application programming interfaces (APIs) for each of the various supported operating-system environments.
- *SCSI-3 Stream Commands (SSC)*, made available by the American National Standards Institute on the web at `http://www.t10.org`.
- *SCSI Primary Commands-2 (SPC-2)*, made available by the American National Standards Institute on the web at `http://www.t10.org`.

Summary of Changes

This section summarizes changes to this publication. A vertical line in the left margin indicates each change.

Fifth Edition (May 2003)

This edition includes the following:
- Ultrium 2 Tape Drive technology
- Native Fibre Channel drive connection
- Multi-Path Architecture
- Ability to partition physical library into three logical libraries
- Control path failover for AIX®
- Additional control paths
- Persistent world wide names
- Universal cleaning cartridge
- Autoclean feature

Fourth Edition (March 2002)

This edition includes the following:
- Enhanced guidelines for handling tape cartridges.
- New procedure for repositioning a misaligned leader pin in a tape cartridge.
- Reclassification of the IBM TotalStorage Ultrium Scalable Tape Library 3583 from a Class B electromagnetic device to a Class A electromagnetic device.

Third Edition (August 2001)

This edition corrects country-sensitive language.

Second Edition (June 2001)

This edition includes new information about the following:
- Addition of Fibre Channel attachment features
- Addition of the Remote Management Unit (RMU)
- Addition of Class I laser product information

Chapter 1. Introduction

The IBM® TotalStorage™ Ultrium Scalable Tape Library 3583 is a stand-alone or rack-mounted device that provides reliable, automated tape handling and storage for unattended mid-range systems and network servers. The library handles a wide range of data storage needs, including backup, archiving, software program distribution, automatic data migration between disk storage and tape, and disaster recovery. It includes the following features:

- Capacity, performance, and attachment improvements through Ultrium 2 Tape Drive technology, including native capacity of 200 GB, native data rate of 35 MB/s, a 2-Gb Fibre Channel interface with fabric attachment, and the Ultra160 Small Computer Systems Interface (SCSI).

- Maximum capacity of 14.4 TB (28.8 TB at 2:1 compression) for Ultrium 2 media.

- Investment protection through the ability of an existing Ultrium Scalable Tape Library to upgrade to any combination of IBM TotalStorage LTO Ultrium 2 Tape Drives and Ultrium 1 Tape Drives. The Ultrium 2 Tape Drive is the second-generation tape drive in the Ultrium series of products.

- Enhanced availability through optional control path failover to a redundant Host Bus Adapter (HBA), a redundant Storage Area Network (SAN), or a redundant library control path when a failure is detected by the IBM device driver.

- Multi-Path Architecture that enables a single library to be shared by multiple homogeneous or heterogeneous applications. The applications available when you optionally partition the library into as many as three logical libraries.

Figure 2 shows the IBM TotalStorage Ultrium Scalable Tape Library 3583.

Figure 2. The IBM TotalStorage Ultrium Scalable Tape Library 3583 (stand-alone configuration)

The Ultrium Scalable Tape Library comes equipped with a minimum of one IBM Ultrium Tape Drive and a robotic system that moves tape cartridges to and from the drive and cartridge storage slots. In addition, the library can mix Ultrium 1 Tape Drives and Ultrium 2 Tape Drives.

The library can accommodate up to six tape drives and up to four storage columns that contain slots for tape cartridges. Three models are available and vary according to their capacity for cartridge storage slots:

Model L18
> Contains 18 cartridge storage slots and offers native data capacity of 3.6 TB (7.2 TB at 2:1 compression)

Model L36
> Contains 36 cartridge storage slots and offers native data capacity of 7.2 TB (14.4 TB at 2:1 compression)

Model L72
> Contains 72 cartridge storage slots and offers native data capacity of 14.4 TB (28.8 TB at 2:1 compression)

Scalability

The Ultrium Scalable Tape Library is designed for easy expansion. You can upgrade any starting configuration to the maximum configuration of 6 Ultrium Tape Drives and 72 tape cartridges. Additional tape drives are modular units that are easy to install and offer enhanced function, such as faster transfer of data, simultaneous backup, concurrent read and write operations, and fault tolerance.

With an optional rackmount kit, you can install the library into an Electronic Industries Association (EIA) standard EIA 14 U rack.

Accessibility

You can access the Ultrium Scalable Tape Library from a remote location by using the IBM TotalStorage Ultrium Tape Library Specialist software application on a web browser. The library features a removable circuit board called the Remote Management Unit (RMU) that facilitates access to the web and the TotalStorage Specialist. Located at the rear of the library, the RMU comes standard in every unit. After you configure the RMU (by setting the Internet protocol (IP) and gateway addresses, as well as the RMU's subnet mask and name), you can perform all of the library's operator panel operations (including firmware updates) from a remote site. The RMU also gives access to library error logs and displays the current status for the library and the drives.

Ease of Attachment

The Ultrium Scalable Tape Library supports communication with the host through Fibre Channel or SCSI connections. New to the library is the use of native Fibre Channel connection. The host is connected directly to a drive, rather than to a SAN Data Gateway Module. Each Fibre Channel Ultrium 2 Tape Drive has a single LC Fibre Channel connector located at the back of the module for attachments.

You can also connect the library to Fibre Channel devices (such as a server) or to a storage area network (SAN) by installing the optional SAN Data Gateway Module hardware component. Accessed through the TotalStorage Specialist software

application, the SAN Data Gateway Module functions as an interface between the SCSI devices in the library and the Fibre Channel devices on the SAN.

Fibre Channel attachment makes possible the following connectivity options:
* Expands the scope of attachment by making the library available to all devices that are attached to the SAN.
* Enables data to be transferred up to 500 m (1640 ft). By contrast, SCSI architecture restricts interconnection distances to a maximum of 25 m (82 ft.)
* Enhances resource sharing by making it easier for many servers to share the library.

With its 2-Gigabit (Gbit) port speeds, the library is compatible with 2-Gbit Fibre Channel components. It is also backward compatible with 1-Gbit Fibre Channel hardware.

Optional Features

Table 1 lists the optional features for the Ultrium Scalable Tape Library.

Table 1. Optional features and codes for the Ultrium Scalable Tape Library

Optional Feature	Feature Code
Ultrium 2 Tape Drive with 2-Gb Fibre Channel interface	8105
Ultrium 2 Tape Drive with High Voltage Differential (HVD) Ultra SCSI interface	8104
Ultrium 2 Tape Drive with Low Voltage Differential (LVD) Ultra160 SCSI interface	8103
Ultrium 1 Tape Drive with LVD Ultra2 SCSI interface	8003
Ultrium 1 Tape Drive with HVD Ultra SCSI interface	8004
SAN Data Gateway Module, LVD	8005
Rackmount kit	8006
18-slot tape storage column	8007
Redundant DC power supply	8008
12-slot I/O station	8012
6-cartridge magazine with cover	8013
Control path failover	1680
Multi-Path feature	9450 (if ordered with new library)
	1450 (if ordered to upgrade existing library)

Library Components

The Ultrium Scalable Tape Library consists of the functional components shown in Figure 3 on page 5.

1 **I/O station**
A cartridge compartment that allow you to insert or remove tape cartridges without the library performing a reinventory of its columns. When you order the library, you can specify a single-slot or 12-slot I/O station.

2 **Operator panel**
The set of controls that lets you perform operations and determine the status of the library. The panel consists of a liquid crystal display (LCD) and push button.

3 **IBM LTO Ultrium Tape Drive**
Contained in a storage column within the library, up to six units that read and write data that is stored on tape cartridges. The library houses both generations of the drive, but certain restrictions apply to the mixing of media. For more information, see "Mixing Media in Drives" on page 13.

4 **Library columns**
Mounted within the library, stationery units that can contain drives and tape cartridges. One column is dedicated to drives; four columns contain I/O or storage slots for cartridges.

5 **Magazines**
Removable containers that can contain up to six tape cartridges. Each cartridge storage column can contain three magazines.

6 **Cartridge storage slots**
Containers that are mounted in cartridge magazines to store tape cartridges.

7 **Robotic system**
The assembly that moves tape cartridges between storage slots, tape drives, and the I/O station.

8 **Host interface board (SCSI)**
A circuit card that houses the SCSI connectors for the medium changer. The SCSI host interface board features both LVD and HVD/DIFF connectors and a configuration switch to change from one interface to another.

9 **SAN Data Gateway Module (optional)**
A hardware component that enables the library to connect to Fibre Channel servers or switches.

10 **Remote Management Unit (RMU)**
A removable circuit board that facilitates access to the library from a remote location. The RMU lets you use a web browser and the library's TotalStorage Specialist software application to perform library functions.

11 **Tape drive sled**
The container that houses a tape drive within the library. The sled allows the drive to easily slide into or from the library. The library can hold six sleds.

12 **ac power supply**
The electrical component that converts standard ac current to the lower-voltage dc current that is used by the library.

13 **dc power supply**
The electrical component that provides dc power to library components.

14 **Redundant dc power supply (optional)**
An electrical component that provides auxiliary power if the main power supply fails.

15 **Serial number**
Located on a label, the serial number of the Ultrium Scalable Tape Library. The serial number also appears on a label inside the front door.
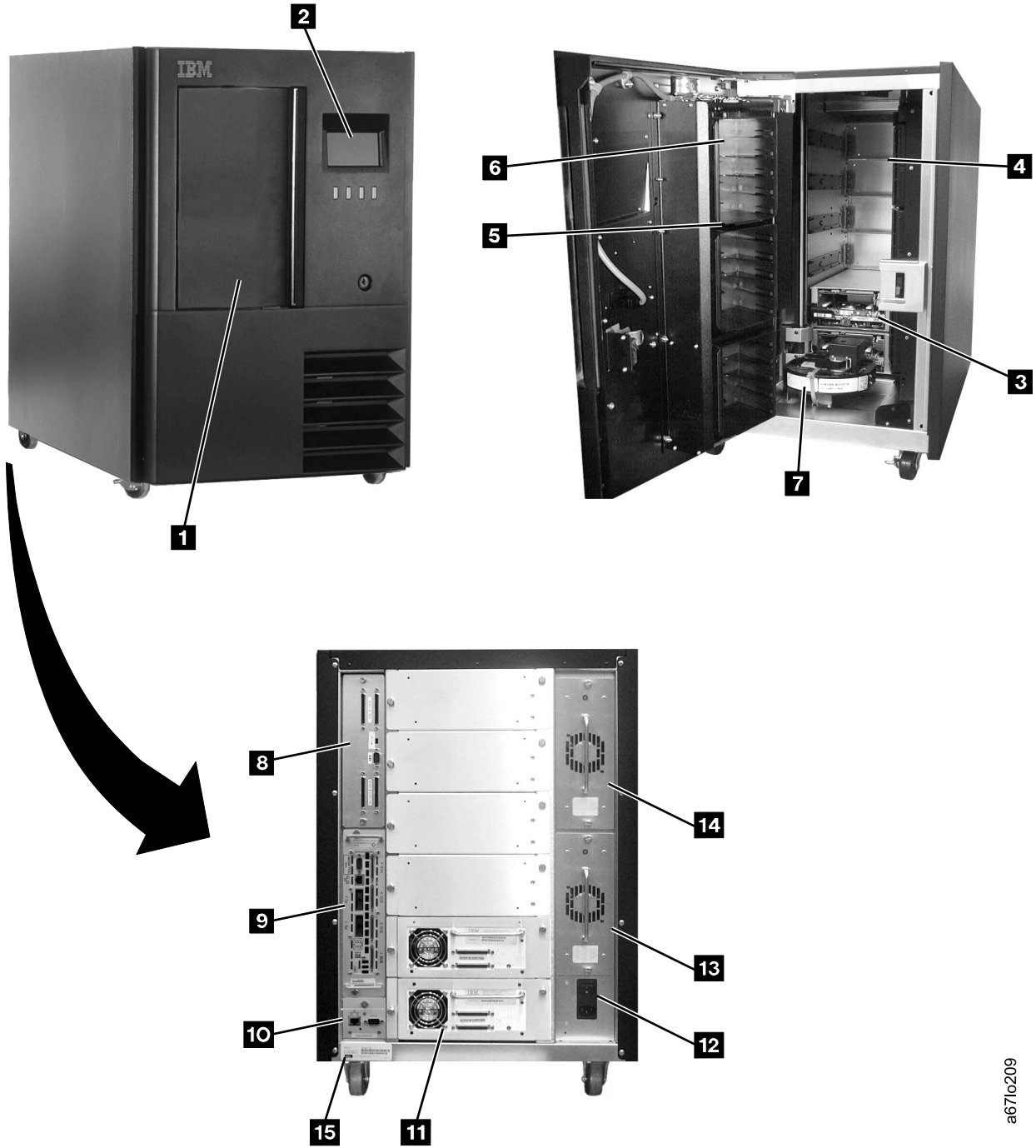
Figure 3. The IBM TotalStorage Ultrium Scalable Tape Library 3583 and its components

Door

The front door of the Ultrium Scalable Tape Library (see **1** in Figure 4 lets you access the magazines and cartridge storage slots that are mounted within. The operator panel **2**, I/O station **3**, door handle **4** and keylock (with key) **5** are all mounted on the door. To unlock and open the door, insert the key into the keylock and turn it counterclockwise approximately 180°.

If you open the door of the Ultrium Scalable Tape Library during operation, the library fails the active operation and rejects new requests for operations until the door is closed. After approximately 15 seconds, the library performs an inventory update (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.

Figure 4. Door of the Ultrium Scalable Tape Library

I/O Station

The I/O station lets you insert and remove cartridges without interrupting the normal operation of the Ultrium Scalable Tape Library. Two types of I/O stations are available:

- **Single-slot I/O station** Holds one IBM LTO Ultrium Tape Cartridge.
- **12-slot I/O station** Holds twelve IBM LTO Ultrium Tape Cartridges. The cartridges are contained in two removable magazines. An additional removal magazine that contains six storage slots is housed inside the front door (below the door of the I/O station).

Figure 5 shows the two types of I/O stations.

Figure 5. Types of I/O stations in the Ultrium Scalable Tape Library. The single-slot I/O station is on the left; the 12-slot I/O station is on the right.

To open the door of the I/O station, grasp the handle on the right and pull the door toward you. To close it, push the door until it is properly seated. After you close the door, it automatically locks while the library performs an inventory of the I/O station. The door unlocks after the inventory is complete.

You can configure the 12-slot I/O station as twelve additional storage slots. For information about the quantity of storage slots, see "Library Columns" on page 8. To configure additional storage slots, see "Configuring the I/O Station as Storage Slots" on page 178.

Library Columns

The Ultrium Scalable Tape Library can have up to five storage columns that are grouped around the picker assembly. Column 1 can contain a single-slot or 12-slot I/O station. Column 2 contains cartridge storage slots and is standard in all libraries. Column 3 contains drives. Columns 4 and 5 may be optionally installed and contain cartridge storage slots. Beginning with Column 1 (the I/O station column), the columns are ordered clockwise. Figure 6 on page 9 shows the arrangements of the columns within the library.

Each cartridge column contains three removable magazines, each of which holds six storage slots. The magazines within each column are designated A to C from top to bottom. The slots within each magazine are numbered 1 to 6 from top to bottom. The drives within the drive column are designated 1 to 6 from bottom to top (see Figure 6 on page 9). A cartridge's physical address is represented as the column, magazine, slot location. Thus, for example, a cartridge with a physical address of [4 C 2] is located in the fourth column, bottom magazine, and second slot from the top.

Single Slot
I/O Station

I/O Slot

Drive
Column 3

Cartridge
Storage
Column 2

Picker
Assembly

Cartridge
Storage
Column 4

Columns
Top View

I/O Station
Column 1

Cartridge
Storage
Column 5

Multiple Slot
I/O Station

Magazine A
(removable
through
I/O Station
door)

Magazine B
(removable
through
I/O Station
door)

Magazine C
(removable
through
front door)

I/O Station
Column 1

Row 1
Row 2
Row 3
Row 4
Row 5
Row 6

Magazines

Fixed Slot

Magazine A
(removable
through
front door)

Magazine B
(removable
through
front door)

Magazine C
(removable
through
front door)

Cartridge Storage
Columns 2, 4, & 5

Drive Sled 6

Drive Sled 5

Drive Sled 4

Drive Sled 3

Drive Sled 2

Drive Sled 1

Drive
Column 3

a67m0125

Figure 6. Storage columns in the Ultrium Scalable Tape Library

To move the media in the library, the server references each movement with source and target designations. The server does this by using element addressing, which specifies which slots to use. For information about element addressing, see Appendix B, "Element Addressing", on page 285.

Though the total number of slots available per storage column is 19, the server can only access 18 slots because the fixed, nonaddressable slot at the top of columns 2, 4, and 5 is reserved for cleaning cartridges and is not available. The library's bar code reader cannot read the label of a cartridge that is stored in the fixed slot.

Table 2 gives I/O and storage slot configurations for each model of the Ultrium Scalable Tape Library.

Table 2. Tape library configurations

Model	Cartridge Storage Columns Installed	Single-Slot I/O Station Installed	12-Slot I/O Station Installed	
			Configured as I/O Station	Configured as Storage Slots
L18	2	Storage Slots: 18 I/O Slots: 1	Storage Slots: 24 I/O Slots: 12	Storage Slots: 36 I/O Slots: 0
L36	2, 4	Storage Slots: 36 I/O Slots: 1	Storage Slots: 42 I/O Slots: 12	Storage Slots: 54 I/O Slots: 0
L72	2, 4, 5	Storage Slots: 54 I/O Slots: 1	Storage Slots: 60 I/O Slots: 12	Storage Slots: 72 I/O Slots: 0

Tape Drives and Drive Sleds

The Ultrium Scalable Tape Library supports the IBM Ultrium 2 Tape Drive and Ultrium 1 Tape Drive. Although the library can contain both LVD and HVD drives, both types of drives cannot reside on the same SCSI bus.

Each tape drive in the Ultrium Scalable Tape Library is packaged in a container called a drive sled. The drive sled is a field replaceable unit (FRU), and is designed for quick removal and replacement in the library. The sections that follow describe the different types of drives.

Ultrium 2 Tape Drives

The IBM Ultrium 2 Tape Drive supports Fibre Channel, LVD Ultra160, or HVD Ultra SCSI interfaces. It features two HD68 connectors or one LC Fibre Channel connector. Figure 7 shows the Fibre Channel Ultrium 2 Tape Drive.
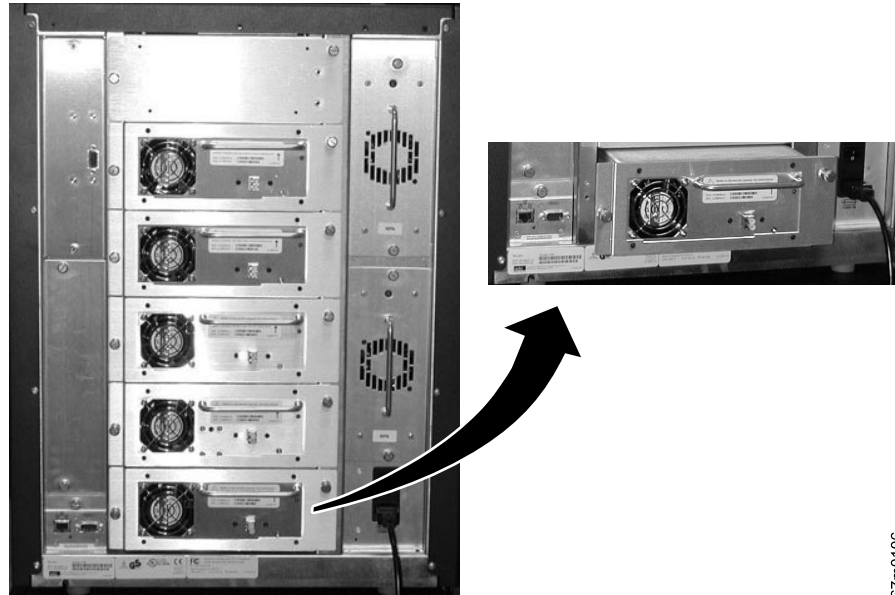
Figure 7. Fibre Channel Ultrium 2 Tape Drive in the Ultrium Scalable Tape Library

Ultrium 1 Tape Drives

IBM Ultrium 1 Tape Drive supports LVD Ultra2 SCSI or HVD Ultra SCSI interfaces. It features two HD68 connectors. Figure 8 shows the Ultrium 1 Tape Drive.
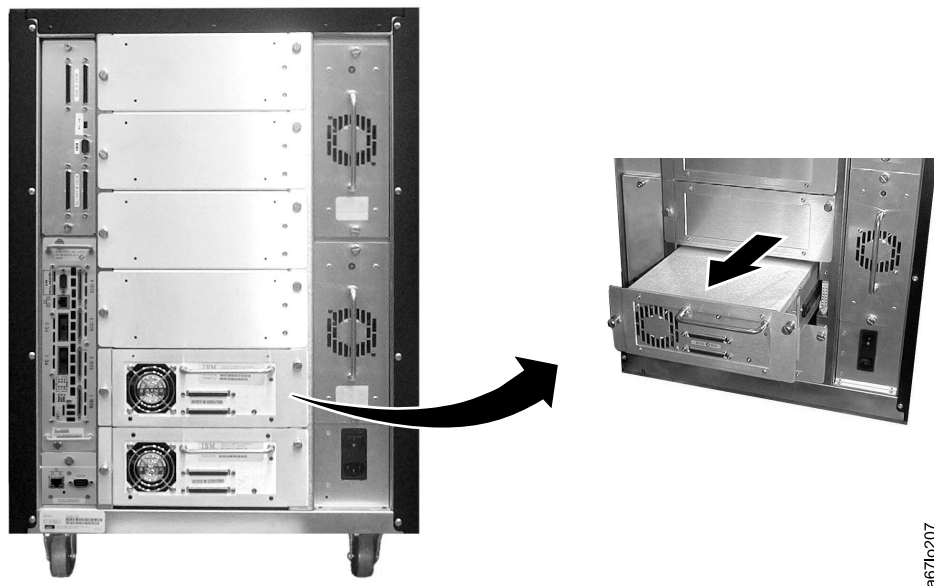
Figure 8. SCSI Ultrium 1 Tape Drive in the Ultrium Scalable Tape Library. The tape drive is contained in a removable drive sled. The view is from the rear of the library.

Speed Matching
To improve system performance, the Ultrium 2 Tape Drive uses a technique called *speed matching* to dynamically adjust its native (uncompressed) data rate to the slower data rate of a server.

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

Power Management
The Ultrium 2 Tape Drive's power management function controls the drive's electronics so that part of them completely turn off when circuit functions are not needed for the drive's operation.

Tape Cartridges

The Ultrium Scalable Tape Library uses 1/2-inch, metal-particle tape with a highly dense recording area that enables capacities shown below.

Table 3. Capacities of supported cartridges

Cartridge	Native Capacity	Compressed Capacity (at 2:1 compression)
Ultrium 2	200 GB	400 GB
Ultrium 1	100 GB	200 GB

Certain restrictions apply to the use of tape cartridges with drives. For an overview of the compatibility between supported cartridges and drives, see Table 4 on page 13.

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

For additional information about the tape cartridges that can be used by the library, see Chapter 5, "Using the Media", on page 245.

Mixing Media in Drives

Not all cartridges that are supported by the Ultrium Scalable Tape Library are compatible with its drives. Table 4 gives a matrix of compatible cartridges and drives.

Note: When labeled according to proper IBM bar code label specifications (see "Bar Code Label" on page 248), the last character of the cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge.

Table 4. Compatible cartridges and drives

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

Notes:

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

Mixing Drive Types

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

For situations where the ISV support does not exist or does not meet your requirements, the Ultrium Scalable Tape Library provides another option to protect your investment by partitioning the tape drives into separate logical libraries. The quantity and location of slots per partition are predetermined and set by using menus on the library's operator panel. You can customize the partition to any number of slots by using menus or special bar code labels. For additional details, see "Multi-Path Architecture" on page 18.

Figure 9 shows examples of methods for mixing Ultrium drive types.
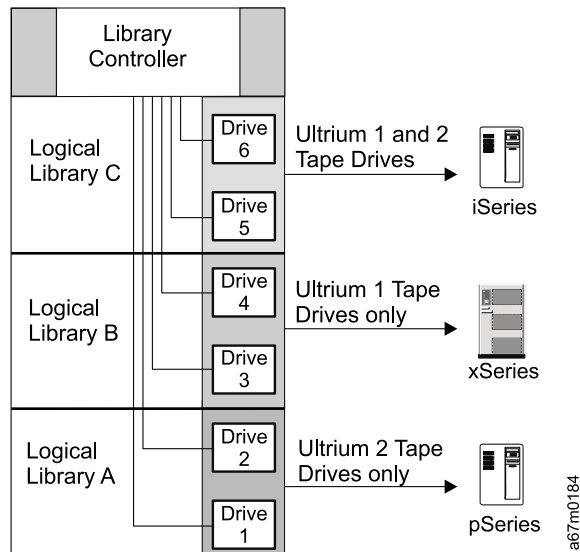
Figure 9. Examples of methods for mixing Ultrium drive types

Robotic System

The robotic system identifies and moves cartridges between the storage slots, tape drives, and the I/O station. The system includes the following components:

- A picker assembly for mounting a cartridge picker and the bar code reader.
- A cartridge picker for picking and placing cartridges in storage slots, tape drives, or the I/O station.
- A bar code reader for reading the external labels on the cartridges. The library uses the bar code reader during the inventory process to locate and categorize all cartridges. The bar code reader is also used during the teaching process where it reads the fiducial labels (the bar code labels on the columns and the magazines) to identify the types of storage and tape drives installed in the library.
- A vertical (Y) axis drive for moving the picker assembly vertically in the library.
- A rotary (X) axis drive for moving the picker assembly between storage and drive columns.
- A reach (Z) axis drive for moving the picker assembly's gripper in a forward and backward motion.

RMU with TotalStorage Specialist

When used with a supported web browser, the Remote Management Unit (RMU) provides remote access to the library over a network. The RMU supports Microsoft® Internet Explorer version 4.0 and above, as well as Netscape Navigator versions 4.01, 4.5, and 4.7X. By attaching the library to the network (through a 10/100 Ethernet port on the RMU) and by using a supported web browser, you can access the library through any server on the network. The RMU lets you access all available functions without a dedicated server or separate software. In addition, when you use the RMU with the TotalStorage Specialist you can perform the following functions remotely:

- Check system status, library and drive conditions, and firmware levels
- Perform all library operator panel functions
- Update firmware in the RMU, the library controller, and the tape drives
- Retrieve the library command and error logs and the RMU error log
- Configure changes, such as network, users, date, and time
- Access online documentation about the library

The RMU supports the Simple Network Management Protocol (SNMP) version 2.0 and can act as an SNMP server by responding to SNMP requests and generating SNMP traps. An internal library serial interface enables the RMU to acquire TapeAlert 3.0 compatibility information from the drives and send this information to an SNMP server. In the event of a power loss, the RMU detects the loss and generates an SNMP trap for notification.

Power

For the Ultrium Scalable Tape Library, the initial connection to a power source is through the ac power supply. The library's dc power is provided by its dc power supply. In the event of power failure, an optional redundant dc power supply is available to continue the library's operation.

Each drive sled in the Ultrium Scalable Tape Library has its own dc power supply. Thus, if one drive fails other drives are not affected.

SAN Data Gateway Module with Web Interface

The Storage Area Network (SAN) Data Gateway Module is a legacy hardware component that, when installed in the Ultrium Scalable Tape Library, serves as an interface between the library and a SAN or Fibre Channel server. When you install the gateway into the library, the gateway connects the SCSI devices in the library to the SAN or to a Fibre Channel server.

The gateway includes two Fibre Channel interfaces and four SCSI interfaces (interfaces are also known as ports). The Fibre Channel ports of the gateway connect to the SAN or to a Fibre Channel server. They provide two independent paths to the SCSI devices in the library. The SCSI ports of the gateway connect to the library's medium changer and tape drives.

A tape library that is attached to a SAN is available to all servers on the SAN. The gateway and all attached devices appear on the SAN or Fibre Channel server as a single Fibre Channel loop ID (LID), with each device addressable at a unique logical unit number (LUN) of that ID. The gateway's address assignments are persistent and will survive the power-up cycles of the library.

The gateway supports any of three available Fibre Channel topologies: point-to-point, arbitrated loop, or switched fabric. It also can function in a public or private loop environment.

By using its TotalStorage Specialist web application, the gateway supports remote management, configuration, and event notification over an Ethernet connection. It can log and analyze events, and runs periodic health checks for predictive failure analysis. These management, configuration, and remote notification capabilities are accessible by using the industry-standard SNMP protocol.

Feature License

The Ultrium Scalable Tape Library uses a feature license to enable the control path failover feature.

The feature license controls the setting of feature-enabled flags that are based on a user input key and the library's serial number that is stored in the library's vital product data (VPD). A unique key exists for each library based on an encryption of the chassis serial number and a feature code.

The feature-enabled flags are stored in the library's VPD and are preserved even when FRU components are replaced. FRU components that contain a serial number also include a flag that allows the serial number to be automatically updated in the field whenever the new part is installed. The serial number is then set to the value of the original component.

After you enable a feature, neither you (the service representative) nor the customer can disable it. The library's serial number can only be assigned at the factory.

The control path failover feature requires the Multi-Path feature.

Multi-Path Architecture

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

- Small Computer Systems Interface (SCSI)
- Fibre Channel

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

The Multi-Path Architecture also lets you configure additional control paths for any one logical library. A control path is a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library. Additional control paths reduce the possibility that failure in one control path will cause the entire library to be unavailable. Use of the control path failover feature further reduces that possibility (see "Using Multiple Control Paths for Control Path Failover" on page 22).

For details about configuring the library to share robotics, see "Library Sharing" on page 19.

Library Sharing

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

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

- Configure the library so that it is partitioned into separate logical libraries that independently communicate with separate applications through separate control paths. This configuration (see example **1** in Figure 10 on page 20) requires no special capabilities from the server or application. (For more information, see "Using Multiple Logical Libraries" on page 21.)

- 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 10 on page 20). This configuration is used by Tivoli® Storage Manager (TSM).

  - Configuring all of the servers to communicate with the library through a single, common control path (see example **3** in Figure 10 on page 20). This configuration is used in high-availability environments such as IBM's High Availability Clustered Microprocessing (HACMP) and Microsoft's Systems Management Server (SMS) and Clustered Server Environments. Multi-initiator configurations are only supported by certain adapters and ISVs. Check with your ISV.

  - Configuring a single logical library to communicate with multiple servers through multiple control paths. This configuration (see example **4** in Figure 10 on page 20) requires that you add control paths (see "Using Multiple Control Paths" on page 22). It is used by Backup Recovery and Media Services (BRMS).

Your library configuration is not limited to the examples shown in "Example Configurations" on page 20 or "Configurations for Logical Libraries" on page 140. Many configurations are possible, and you can design them according to your business needs.

Example Configurations

1 — Library Controller

Logical Library C — Drive 6, Drive 5 → Application 1 — pSeries

Logical Library B — Drive 4, Drive 3 → Application 2 — NT

Logical Library A — Drive 2, Drive 1 → Application 3 — pSeries

The library is partitioned into separate logical libraries that independently communicate with separate applications via separate control paths.

2 — Library Controller

Logical Library A — Drive 6, Drive 5, Drive 4, Drive 3, Drive 2, Drive 1

Host 6, Host 5, Host 4, Host 3, Host 2, Host 1 — Host Network

All hosts are running the same application. One host communicates with the library via a single control path. Other hosts send requests to that host via the network.

3 — Library Controller

Logical Library A — Drive 6, Drive 5, Drive 4, Drive 3, Drive 2, Drive 1

Host 1, Host 2 — Host Network

All hosts are running the same application and communicate with the library via a single, common control path.

4 — Library Controller

Logical Library A — Drive 6 → Host 6, Drive 5 → Host 5, Drive 4 → Host 4, Drive 3 → Host 3, Drive 2 → Host 2, Drive 1 → Host 1 — Host Network

All hosts are running the same application. Each host communicates with the same logical library via multiple control paths. The additional control paths reduce the possibility that a single point of failure will affect the whole library.

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Figure 10. Examples of configurations for a Ultrium Scalable Tape Library. Lines from one or more drives to the library controller represent control paths.

Using Multiple Logical Libraries

To maximize your investment, you can use multiple logical libraries to share the physical library between applications or to support mixed drive types for any application.

You can partition the Ultrium Scalable Tape Library into a maximum of three 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). 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.

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.

The sections that follow describe these uses for multiple logical libraries. To create or change multiple logical libraries within your library, refer to "Partitioning the Library" on page 139.

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 column for a different logical library. For additional details, see "Cleaning Drives" on page 244.

Using Multiple Logical Libraries for Library Sharing

Multiple logical libraries are an effective way for the Ultrium Scalable Tape Library to simultaneously back up and restore data from heterogeneous applications. For example, you can partition the library so that it processes commands from Application 1 (about Department X) in Logical Library A, commands from Application 2 (about Department Y) in Logical Library B, and commands from Application 3 (about Department Z) in Logical Library C. 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 X is confined to the storage slots and drives in Logical Library A, processing for Department Y is confined to the storage slots and drives in Logical Library B, and so forth.

Using Multiple Logical Libraries for Mixed Drive Types

For applications that cannot support Ultrium 1 and Ultrium 2 drives and media in the same logical library, you can partition multiple logical libraries to keep the drives and media separate. By partitioning the physical library into one or more logical libraries, you ensure investment protection for any one Ultrium 1 Tape Drive.

Note: The AS/400® and iSeries™ servers require that you separate unlike drives into separate logical libraries.

Using Multiple Control Paths

In addition to creating multiple logical libraries, you can also configure any logical library to have more than one control path. When you configure additional control paths, additional library sharing configurations and availability options are made possible. Access to the logical library is on a first-come, first-served basis and each control path for a logical library can accept commands while the library is in use by another control path. By default, a logical library can communicate with the server only through the first LUN-1-enabled drive that is installed in the partition.

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

To add or remove additional control paths, refer to "Adding or Removing Control Paths" on page 120. For a particular logical library, you can enable as many control paths as there are drives in that logical library.

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

Using Multiple Control Paths for iSeries and AS/400 Attachment

The use of control paths for the iSeries and AS/400 servers is unique. In general, every iSeries adapter must "see" the control path that is associated with the drives to which it is connected. For the iSeries and AS/400 servers, Table 5 lists the quantity of drives that are supported by a particular adapter and operating system (OS/400® 5.1 or OS/400 5.2).

Table 5. Quantity of drives that are supported per adapter and operating system for iSeries and AS/400 servers

Type of Adapter	Quantity of Ultrium 2 Tape Drives		Quantity of Ultrium 1 Tape Drives	
	OS/400 5.1	OS/400 5.2	OS/400 5.1	OS/400 5.2
HVD	1 to 6	1 to 6	1	1
LVD	1 to 6	1 to 6	N/A	N/A
Fibre Channel	1 to 6	1 to 6	1 to 6	1 to 6
Note: N/A = not applicable				

Using Multiple Control Paths for Control Path Failover

Command failures and timeouts are costly. You want your library to run smoothly and efficiently. To ensure continued processing, the Ultrium Scalable Tape Library offers an optional control path failover feature that enables the host device driver to resend the command to an alternate control path for the same logical library. With control path failover installed, the alternate control path can include another HBA, SAN, or library control path drive. The device driver initiates error recovery and continues the operation on the alternate control path without interrupting the application. Only AIX hosts are currently supported for this feature.

The control path failover feature can be enabled at the factory, or it can be ordered later and installed by the customer. To order the feature, the customer can call an IBM Sales Representative.

Note: The control path failover feature is activated by a license key.

For more information about using the control path failover feature, see the *IBM Ultrium Device Drivers Installation and User's Guide*.

Supported Servers, Operating Systems, and Software

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

- Visit the web at `http://www.ibm.com/storage/lto`. Select `LTO support`, then `Interoperability matrix and software (ISVs)`. Under `Supported servers and operating systems` or `Supported storage management software`, select `IBM TotalStorage Ultrium Scalable Tape Library 3583`.
- Contact your IBM Sales Representative.

Notes:

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

Supported Device Drivers

Device drivers are included in the ship group for the Ultrium Scalable Tape Library. IBM maintains the latest levels of device drivers and driver documentation for the library on the Internet. You can use one of the following procedures to access this material. **(Note: If you do not have Internet access and you need information about device drivers, contact your Marketing Representative.)**

- Using a browser, type one of the following:

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

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

  `ftp://207.25.253.26/storage/devdrvr`

- Using File Transfer Protocol (FTP), enter the following specifications:

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

  IP Addr: `207.25.253.26`

  Userid: `anonymous`

  Password: (use your current e-mail address)

  Directory: `/storage/devdrvr`

IBM provides Portable Document Format (PDF) and Postscript versions of its device driver documentation in the /storage/devdrvr/Doc 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*.

A list of device drivers for each supported server appears at /storage/devdrvr/ in the following directories (the device driver for the AS/400 server and iSeries server is included in the OS/400 operating system).

- AIX
- HPUX
- Linux
- Solaris
- Windows

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

Server Attachment

You can attach the Ultrium Scalable Tape Library to servers by using:
- SCSI interface (through a single or multi-path connection)
- Native Fibre Channel interface
- SAN Data Gateway Module interface

The sections that follow describe each type of interface.

SCSI Interface

The Ultrium Scalable Tape Library operates as a set of SCSI-3 devices. For drives that use a SCSI interface, the following conditions apply:
- The Ultrium 2 Tape Drive can attach to a server through a Low Voltage Differential (LVD) Ultra160 SCSI interface or a High Voltage Differential (HVD) Ultra SCSI interface
- The Ultrium 1 Tape Drive can attach to a server through an LVD Ultra2 SCSI interface or an HVD Ultra SCSI interface

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

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 and lengths are followed according to SCSI-3 standards

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

You can attach the SCSI interface through a single path or multi-path connection.

Important: If you are using an AS/400 server and HVD drives, the AS/400 adapters are HVD SCSI and support only one initiator per bus. In addition, the medium changer and tape drives must be attached on the same SCSI bus. For these, and other tape drive performance reasons, a SCSI-configured tape library must be a single-drive, single-host configuration when attached to the AS/400.

For more information, see Chapter 7, "Using the SCSI Interface", on page 273.

Fibre Channel Attachment

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.

Class I

To attach the library to a Fibre Channel interface it must be equipped with the Multi-Path feature, which is activated by a feature license. For more information, see "Entering the Control Path Failover License Key" on page 188.

The 2-Gb interface is a 200-MB-per-second, full-duplex, serial-communications technology capable of interconnecting Ultrium Tape Drives that are separated by as much as 10 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). The technology offers a transport mechanism for delivering commands, and provides high performance by allowing processing to be done in the hardware.

You can establish Fibre Channel connections between Fibre Channel ports that reside in the Ultrium Scalable 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.

The sections that follow describe ways to connect the library to a Fibre Channel server. For more information, see Chapter 6, "Using the Fibre Channel Interface", on page 267.

Attaching by Using a Native Fibre Channel Connection

A library that supports native Fibre Channel attachment communicates with a server through an intermediary multi-path interface in one or more installed drives. In this type of connection, a host is connected directly to a drive rather than a library. Communication is accomplished as a host sends commands to and receives status or responses from one or more drives with multi-path interfaces.

Only Ultrium 2 Tape Drives support native Fibre Channel connections. Each drive has a single LC fiber connector located at the back.

Attaching by Using the SAN Data Gateway Module

The gateway is the interface between the tape library and the SAN or Fibre Channel server. It provides Fibre Channel connectivity to the SCSI tape drives and SCSI medium changer in the library. Two Fibre Channel ports are available on the gateway. Each port is equipped with a gigabit interface converter (GBIC) module that lets you connect a fiber cable. The GBIC (part number 19P3259) can transmit data at up to 2 Gbits per second by using a short-wave, multimode, subscriber connector (SC). Figure 11 on page 26 shows the GBIC module.
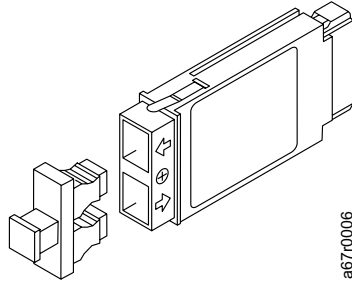
Figure 11. Gigabit interface converter (GBIC) module with dust protector

The gateway also has four LVD Ultra2 SCSI ports to which you can attach tape drives and the medium changer. To make the LVD connectors active, you must attach the gateway to the LVD connectors of the medium changer and you must set the configuration switch.

Note: The SAN Data Gateway Module supports only tape drives that use an LVD (SCSI) interface.

For a list of the supported adapters that you can use when connecting the Fibre Channel interface, visit the web at:
`http://www.storage.ibm.com/hardsoft/tape/lto/compatibility.html`

Specifications

"Specifications" lists the specifications for the Ultrium Scalable Tape Library. Specifications for tape cartridges are given in "Environmental and Shipping Specifications for Tape Cartridges" on page 255.

Table 6. Specifications for the Ultrium Scalable Tape Library

Specification	Measurement		
Physical Specifications			
Width	44.1 cm (17.4 in.) rack unit		
	48.1 cm (18.9 in.) stand alone unit		
Depth	73.5 cm (28.9 in.)		
Height	68.5 cm (27.0 in.) (with casters)		
Weight (6 drives and 72 cartridges)	65.8 kg (145 lb) (minimum configuration, no cartridges)		
	101.6 kg (224 lb) (maximum configuration, no cartridges)		
	118.4 kg (261 lb) (maximum configuration, with cartridges)		
Height of library in rack	14 EIA units		
Power Specifications			
Voltage	100 to 240 Vac, 50 to 60 Hz		
Current for 100 Vac	7.0 A		
Current for 240 Vac	3.5 A		
Maximum electrical power	0.840 kVA		
Inrush current	45 A at 120 Vac, 90 A at 208 Vac		
Other Specifications			
Maximum altitude	2500 m (8202 ft) for operating and storage		
Environmental Specifications			
Environmental Factor	**Operating (see Note)**	**Storage**	**Shipping**
Drive temperature	10 to 38°C (50 to 100°F)	−40 to 60°C (−40 to 140°F)	−40 to 60°C (−40 to 140°F)
Heat output	542 W (483 Cal/Hr)	Not applicable	Not applicable
Relative humidity	20 to 80%	10 to 90%	10 to 90%
Maximum wet bulb temperature	26°C (79°F)	Noncondensing	Noncondensing
Note: The operating environment of the library must not conflict with the media storage requirements (see "Environmental and Shipping Specifications for Tape Cartridges" on page 255. The library may be capable of operating at elevated temperatures for an extended period of time, the temperature could shorten the useful life of media that is stored in the library. If media is stored in the library for more than 10 hours, the storage temperature requirements for media should be met. It should be assumed that media stored in the library will be 2 degrees above ambient temperature when the library is powered on.			

Product Environment

The Ultrium Scalable Tape Library meets the acoustical requirements for a data processing center.

To allow for service access, install the library a minimum of 0.9 m (3 ft) from all obstacles.

The library is a precision computer peripheral. To ensure its maximum longevity, use the following guidelines:

- Place the library away from dust, dirt, and airborne particulates.
- Keep the library away from high-traffic areas, especially if the floor is carpeted. Carpeting harbors dust, and people walking on the carpet can cause the carpet fibers and dust to become airborne.
- To avoid toner residue and paper dust, keep the library out of printer rooms. Do not store paper supplies next to the library.
- Keep the library away from moving air that is caused by doorways, open windows, fans, and air conditioners.
- Keep the library's doors closed to minimize any contamination from airborne particles.

Tape Drive Performance

Table 7 lists the drive performance characteristics of the Ultrium Tape Drives.

Table 7. Performance characteristics of the Ultrium Tape Drives

Performance Characteristic	Tape Drive	
	Ultrium 2 Tape Drive	Ultrium 1 Tape Drive
Native sustained data rate	35 MB/s (with Ultrium 2 media)	15 MB/s
	20 MB/s (with Ultrium 1 media)	
Compressed data rate (at 2:1 compression)	70 MB/s (with Ultrium 2 media)	30 MB/s
	40 MB/s (with Ultrium 1 media)	
Maximum sustained data rate (at maximum compression)	110 MB/s	60 MB/s
Burst data rate for Fibre Channel drives	200 MB/s	100 MB/s
Burst data rate for Low Voltage Differential (LVD) SCSI drives	160 MB/s (Ultra160)	80 MB/s (Ultra2)
Burst data rate for High Voltage Differential (HVD) SCSI drives	40 MB/s (Ultra)	40 MB/s (Ultra)
Nominal load-to-ready time	15 seconds	20 seconds
Nominal unload time	15 seconds	18 seconds
Average search time to first byte of data	49 seconds	73 seconds
Note: All sustained data rates are dependent on the capabilities of the interconnect (for example, an Ultra SCSI bus is limited to less than 40 MB/s).		

Chapter 2. Installation

Attention: The Ultrium Scalable Tape Library is a customer setup unit. It is the customer's responsibility to install this product.

To ensure optimum performance, obtain the latest level of firmware from the web by visiting `http://www.ibm.com/storage/lto`. After you access the web site, select Technical Support to locate and download the firmware. Be sure to verify that you have the latest firmware installed on your machine before you contact IBM for any necessary technical support.

If you choose not to install this product yourself, IBM will install it for a fee. You can purchase installation services by contacting your local IBM Service office or your IBM Business Partner.

Installation Overview

Table 8 gives an overview of the steps that are required to install the Ultrium Scalable Tape Library. The installation is complete after you perform all of the steps.

Table 8. Overview of the installation procedure

Step	Description	Page Location
1	Unpack the library	31
2	Install a rackmount library	32
	Install a stand-alone library	36
3	Install any of the optional features	See list in Table 1 on page 3
4	Attach the SCSI or Fibre Channel cables	57
5	Power-on and run the FAST Read/Write tests	65
6	Configure the RMU	70
7	If installed, configure the SAN Data Gateway Module. Refer to the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*	Not applicable
8	If necessary, set the SCSI IDs	74
	If necessary, set the Fibre Channel Loop IDs	76
9	If necessary, update the firmware for the drive and the library	77
10	If necessary, install the host bus adapter	77
11	If necessary, install IBM device drivers and commercial backup application software	77
12	Configure the library to the server	78

Step 1. Unpacking the Library

To unpack the Ultrium Scalable Tape Library, read the printed instructions located on the shipping container.

Inspect the library for shipping damage. If there is damage, do not install it. Report the damage immediately by contacting your place of purchase.

Step 2. Deciding the Physical Configuration

You can install the Ultrium Scalable Tape Library as a stand-alone model or in a standard 19-inch rack (14 U of space is required):

- To install the library as a stand-alone unit, go to "Installing a Stand-Alone Library".
- To install the library in a rack, go to "Installing the Library into a Rack (optional)" on page 36.

Installing a Stand-Alone Library

Before you begin the installation, complete the following tasks.

- Familiarize yourself with the installation instructions and understand the requirements for connecting cables between the server, the library, and the tape drives.
- Use the inventory checklist to verify that you have received the items that are required for installation.

Reviewing the Inventory Checklist

___ 1. Front door key (taped to the back of the library)

___ 2. Power cord (for the appropriate cord for your country or region, see Appendix F, "Power Cords", on page 325)

___ 3. Up to six optional Ultrium Tape Drives with drive-to-drive SCSI cable (0.4 m) and terminator

___ 4. Host-to-device SCSI bus cable, 4.5 m or 5 m (as specified or ordered)

___ 5. Device-to-device SCSI bus cable (0.7 m) for connection between the SCSI host interface board and the first drive

___ 6. LVD single-connector SCSI wrap tool or HVD/DIFF single-connector SCSI wrap tool, or both

___ 7. Serial cable (straight through; that is, the cable's wires connect to identical connector pins on each end)

___ 8. Optional SAN Data Gateway Module (if ordered)

    ___ a. Four VHDCI-to-HD68 SCSI bus cables (0.6 m)

    ___ b. Two 2-Gbit GBICs (installed in gateway)

    ___ c. LVD terminator

    ___ d. *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*

    ___ e. Service accessory kit:

        - VHDCI-to-VHDCI SCSI wrap cable (0.5 m)

        - SC-to-SC Fibre Channel coupler block

        - Gateway service tools:

            – Null modem cable

            – Ethernet wrap tool

            – Fibre Channel wrap tool

___ 9. Optional native Fibre Channel cable (if ordered)

___ 10. Optional native Fibre Channel wrap tool (if ordered)

___ 11. IBM LTO Ultrium Data Cartridge

___ 12. IBM LTO Ultrium Cleaning Cartridge

___ 13. Device driver kit that includes:

- CD that contains the Open Systems Device Drivers
- Copy of the *IBM Ultrium Device Drivers Installation and User's Guide*

>   **Note:** Device driver support is subject to change. For information about the latest supported device drivers (and to download them), see "Supported Device Drivers" on page 23.

__ 14. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Quick Reference*

__ 15. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide* (this guide)

__ 16. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*

__ 17. *IBM Externally Attached Devices Safety Information* manual

>   **Note:** To ensure that you have the latest publications and the latest firmware, visit the web at `http://www.ibm.com/storage/lto`.

Performing the Installation Procedure

**> 55 kg
(121.2 lb)**

CAUTION:
The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes four people with a lifting device to safely lift this part or unit.

There are no required tools for installing a stand-alone library

1. Use the sling (see **1** in Figure 12) that is shipped with the Ultrium Scalable Tape Library to lift and move the library into place. It is recommended that four people use the handles **2** of the sling to lift the library. If you are installing the library on a raised floor, place the hole cutout under the rear of the frame.

Figure 12. The sling for lifting the Ultrium Scalable Tape Library

2. Lock the two front casters **1** in place by turning the latch **2** counterclockwise (see Figure 13).
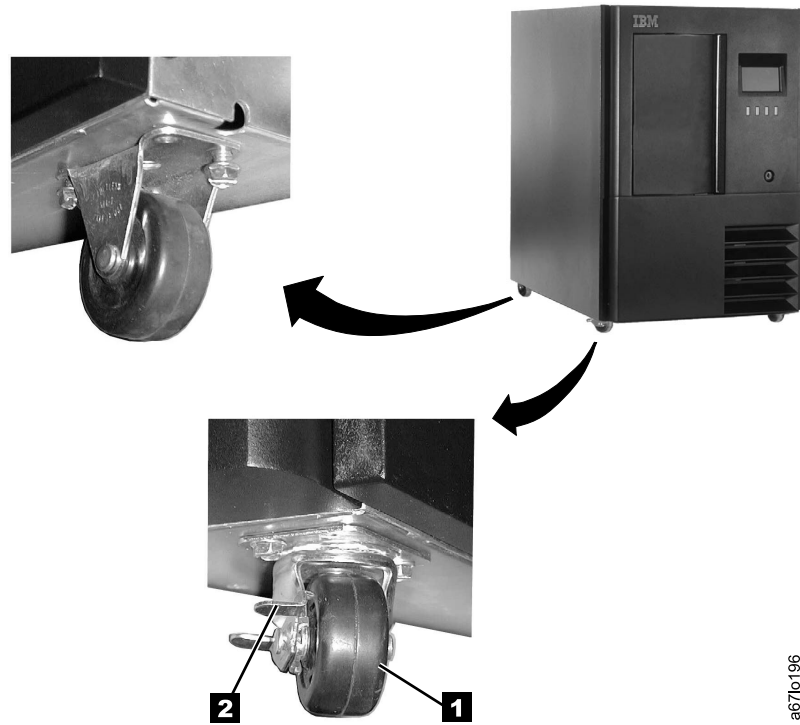
Figure 13. Locking front casters

3. Open the front door **1** by using the key **2** (see Figure 14).
4. Remove the band **3** that secures the picker assembly **4** to the frame.
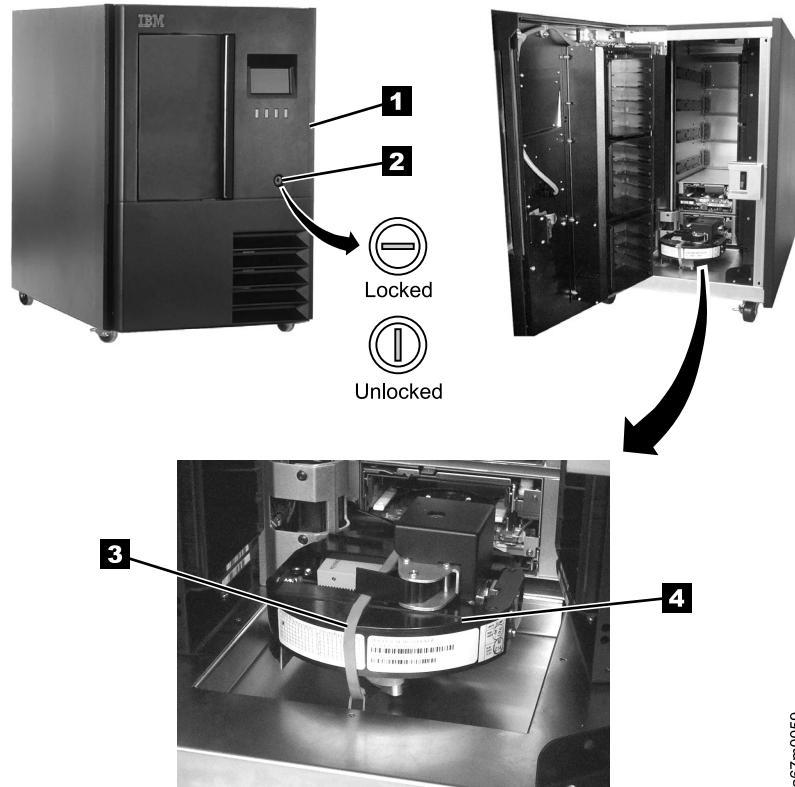
Figure 14. Installing a stand-alone library

5. Close the front door securely.
6. Perform one of the following:
   - If you intend to install one or more optional features, go to "Step 3. Installing Optional Features" on page 49.
   - If you do not intend to install an optional feature, go to "Step 4. Attaching the Cables" on page 57.

Installing the Library into a Rack (optional)

To install the Ultrium Scalable Tape Library into a rack, the Rackmount Kit (feature code 8006) is required.

Before you begin the installation, complete the following tasks.

- Familiarize yourself with the installation instructions and understand the requirements for connecting cables between the server, the library, and the tape drives.
- Use the inventory checklist to verify that you have received the items that are required for installation.

Reviewing the Inventory Checklist

___ 1. Front door key (taped to the back of the library)

___ 2. Power cord (for the appropriate cord for your country or region, see Appendix F, "Power Cords", on page 325)

___ 3. Up to six optional Ultrium Tape Drives with drive-to-drive SCSI cable (0.4 m) and terminator

___ 4. Host-to-device SCSI bus cable (4.5 m or 5 m as specified or ordered)

___ 5. Device-to-device SCSI bus cable (0.7 m) for connection between the SCSI host interface board and the first drive

___ 6. LVD single-connector SCSI wrap tool or HVD/DIFF single-connector SCSI wrap tool, or both

___ 7. Serial cable (straight through; that is, the cable's wires connect to identical connector pins on each end)

___ 8. Optional SAN Data Gateway Module (if ordered)

    ___ a. Four VHDCI-to-HD68 SCSI bus (signal) cables (0.6 m)

    ___ b. Two 2-Gbit GBICs (installed in gateway)

    ___ c. LVD terminator

    ___ d. *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*

    ___ e. Service accessory kit:

        - VHDCI-to-VHDCI SCSI wrap cable (0.5 m)

        - SC-to-SC Fibre Channel coupler block

        - Gateway service tools:
            – Null modem cable
            – Ethernet wrap tool
            – Fibre Channel wrap tool

___ 9. Optional native Fibre Channel cable (if ordered)

___ 10. Optional native Fibre Channel wrap tool (if ordered)

___ 11. IBM LTO Ultrium Data Cartridge

___ 12. IBM LTO Ultrium Cleaning Cartridge

___ 13. Rackmount Kit (feature code 8006)

___ 14. Device driver kit that includes:

    - CD that contains the Open Systems Device Drivers

    - Copy of the *IBM Ultrium Device Drivers Installation and User's Guide*

    Note: Device driver support is subject to change. For information about the latest supported device drivers (and to download them), see "Supported Device Drivers" on page 23.

__ 15. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Quick Reference*

__ 16. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide* (this guide)

__ 17. *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*

__ 18. *IBM Externally Attached Devices Safety Information* manual

> **Note:** To ensure that you have the latest publications and the latest firmware, visit the web at `http://www.ibm.com/storage/lto`.

Reviewing the Guidelines

For proper library operation and to meet safety requirements, review the following guidelines before performing the installation:

- Do not install the Ultrium Scalable Tape Library in a rack where the maximum internal ambient temperature will exceed 38°C.

- Do not install the Ultrium Scalable Tape Library in a rack where the airflow is compromised. Do not block or otherwise restrict airflow to the power supply front or rear vents.

- When installing the Ultrium Scalable Tape Library into a rack, ensure that a hazardous condition is not created due to uneven mechanical loading. If the rack has a stabilizer, it must be firmly attached before you install or remove the library.

- The Ultrium Scalable Tape Library requires 6 amps of power with an input of 100 Vac or 3 amps with an input of 240 Vac. Connect the library to the power supply circuit so that the overloading of circuits does not compromise the supply wiring or overcurrent protection.

- Ensure that the Ultrium Scalable Tape Library is properly grounded when in the rack (see step 10 on page 47).

- Use the sling (see **1** in Figure 12 on page 33) that is shipped with the Ultrium Scalable Tape Library to lift and move the library into place. It is recommended that four people use the handles **2** of the sling to lift the library.

Figure 15. The sling for lifting the Ultrium Scalable Tape Library

Unpacking the Rackmount Kit

1. Open the shipping carton and remove the components of the kit (see Figure 16 on page 39).
2. Verify that you received the parts listed in Table 9.

Table 9. Components of Rackmount Kit

Component Number	Description	Quantity
1	Screw, pan head Phillips, M5 x 16 mm, .8 pitch, black zinc	10
2	Finishing washer, M5, black polyamide	10
3	Cage nut, M5 (for rack rails that have square mounting holes)	10
4	Clip nut, M5 x .8, steel (for rack rails that have round mounting holes)	10
5	Front mounting bracket	2
6	Rear mounting bracket	2
7	Screw, flat head, 8–32 x 3/8 in.	4
8	Screw, pan head Phillips, 8–32 x 3/8 in.	2
9	Rear stop bracket	1
10	Nut, with integral lock washer, 8–32	2
	Power cords (not shown)	2

Rear View
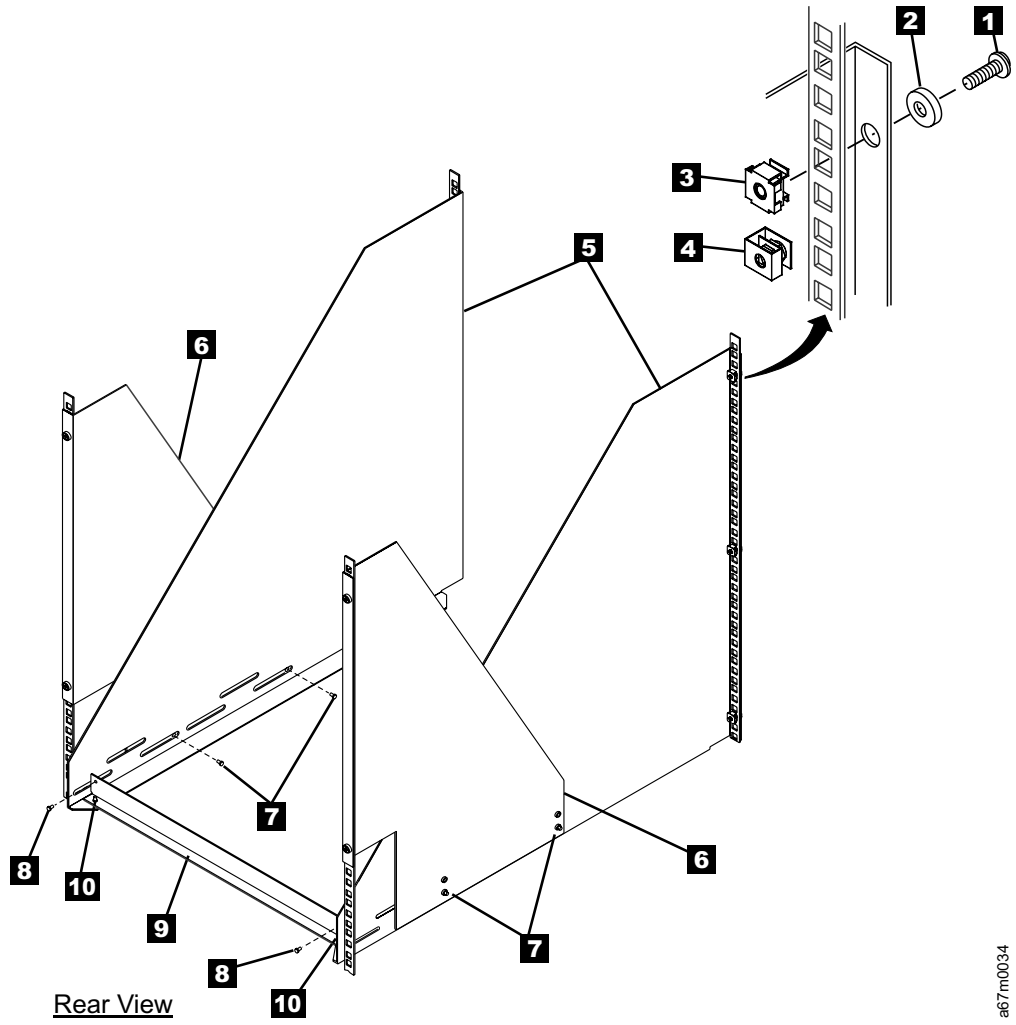
Figure 16. Components of the rackmount kit

a67m0034

Installing the Rackmount Hardware

Required tools (not supplied): Phillips screwdriver and a 11/32-in. nut driver or wrench.

1. The Ultrium Scalable Tape Library requires 14 U of space in a standard 19-in. rack. Ensure that the space is available and allocated in the rack.

   Note: Each U is 4.45 cm (1.75 in.) and is usually marked by three holes in the rack (see Figure 17).

4.45 cm
(1.75 in.)

4.45 cm
(1.75 in.)

4.45 cm
(1.75 in.)

4.45 cm
(1.75 in.)

a67lo126
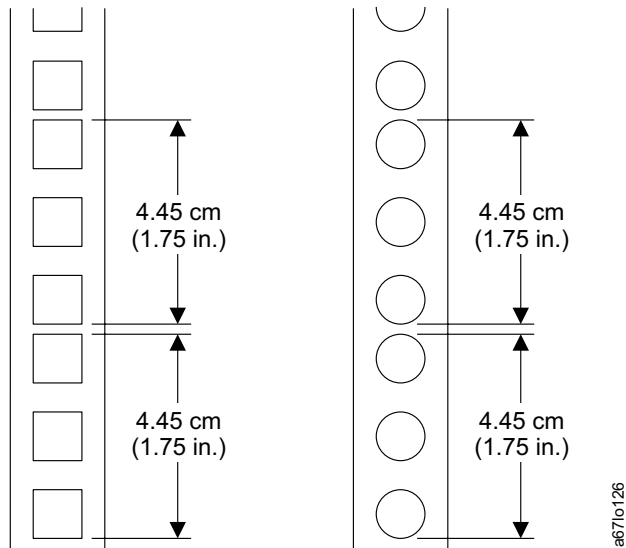
Figure 17. Example of standard racks

2. If you are installing the library into a rack that has a front door, remove the front door to simplify the subsequent steps.

3. If the rack has a stabilizing mechanism, such as wheel locks, ensure that they are locked and the rack is stable before proceeding.

4. Place one of the front mounting brackets (see **7** in Figure 18) next to the rail **6** . Using the bracket as a template, install three cage nuts **3** (or clip nuts **4**) into the holes in the rail that are in line with the holes in the mounting bracket. Repeat this step for the second front mounting bracket.

   Note: Figure 18 shows both clip nuts and cage nuts, but you must install only one type of nut.

5. Perform one of the following:
   • For racks with square mounting holes, install cage nuts. Pinch the flanges of the nut together until it fits into the square on the vertical rail, then release the flanges.
   • For racks with round mounting holes, install clip nuts. Slide the clip nut onto the rail until it fits into the hole.

6. Position the front mounting brackets **7** so that the flanges **5** are on the outside of the front vertical rails **6** .

7. Secure the brackets to the rails with three Phillips screws **1** and three finishing washers **2** .
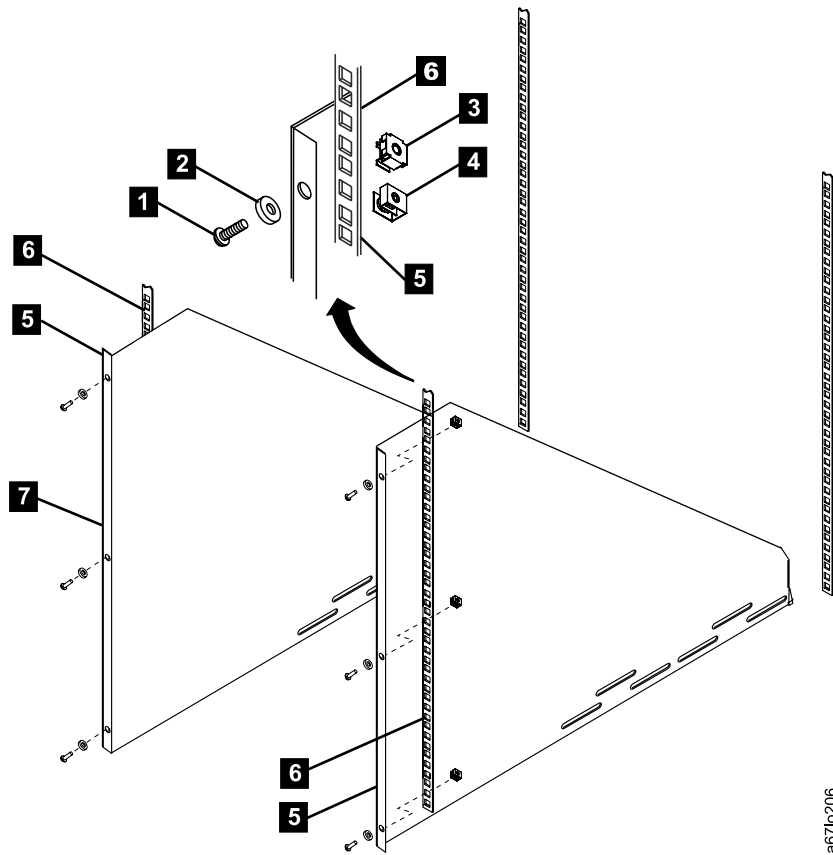
Figure 18. Installing the front mounting brackets

8. Place one of the rear mounting brackets (see **7** in Figure 19) next to the rail **6** . Using the bracket as a template, install two cage nuts **3** (or clip nuts **4**) into the holes in the rail that are in line with the holes in the mounting bracket. Repeat this step for the second rear mounting bracket.

9. Position the rear mounting brackets **7** so that the flanges **5** are on the outside of the rear vertical rails **6** .

10. Secure the brackets loosely to the rails with two Phillips screws **1** and two finishing washers **2** .

Rear View

a67lo128
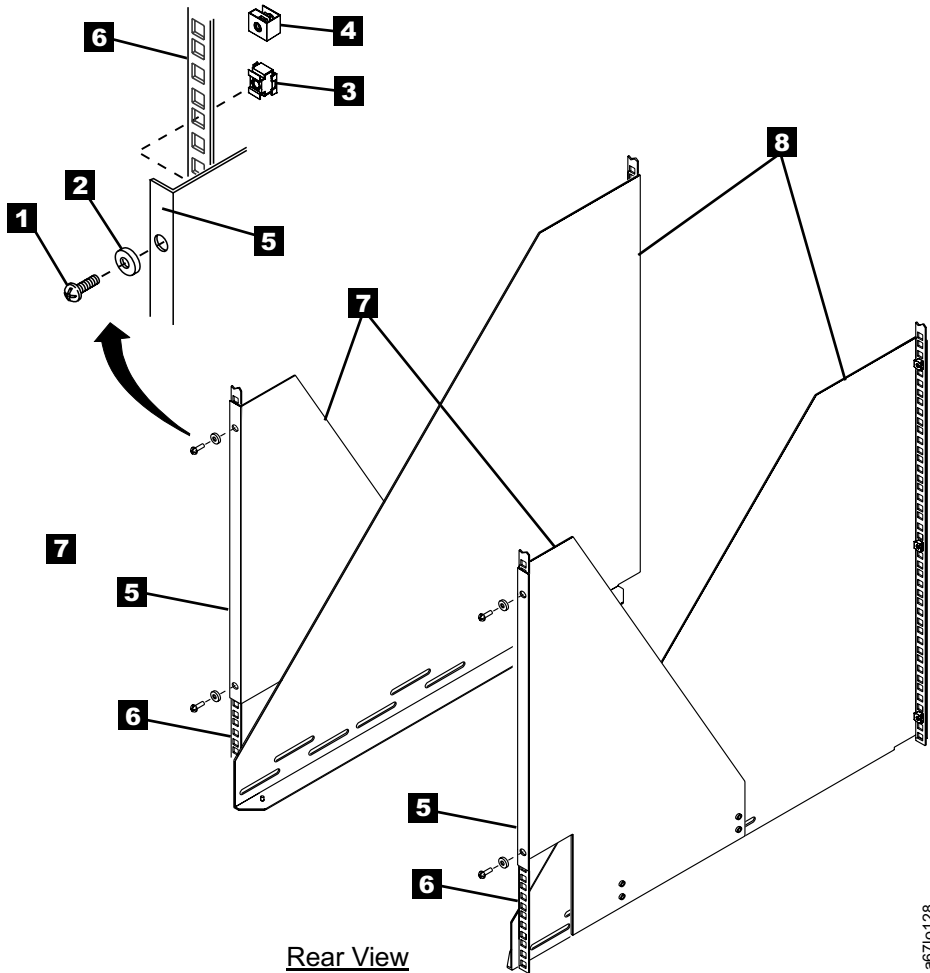
Figure 19. Installing the rear mounting brackets

11. Attach the front mounting brackets (see **2** in Figure 20) to the rear mounting brackets **1** by placing four screws **3** through the slots, two on each side. Secure the brackets loosely by tightening the screws.

12. Place the rear stop bracket **4** on the studs **5** located on the mounting brackets **2** . To have clearance for the rear stop bracket, you may need to push the front mounting brackets against the rear vertical rails. Secure the rear stop bracket by tightening the two nuts **6** .

13. Tighten all nuts and screws.

Rear View
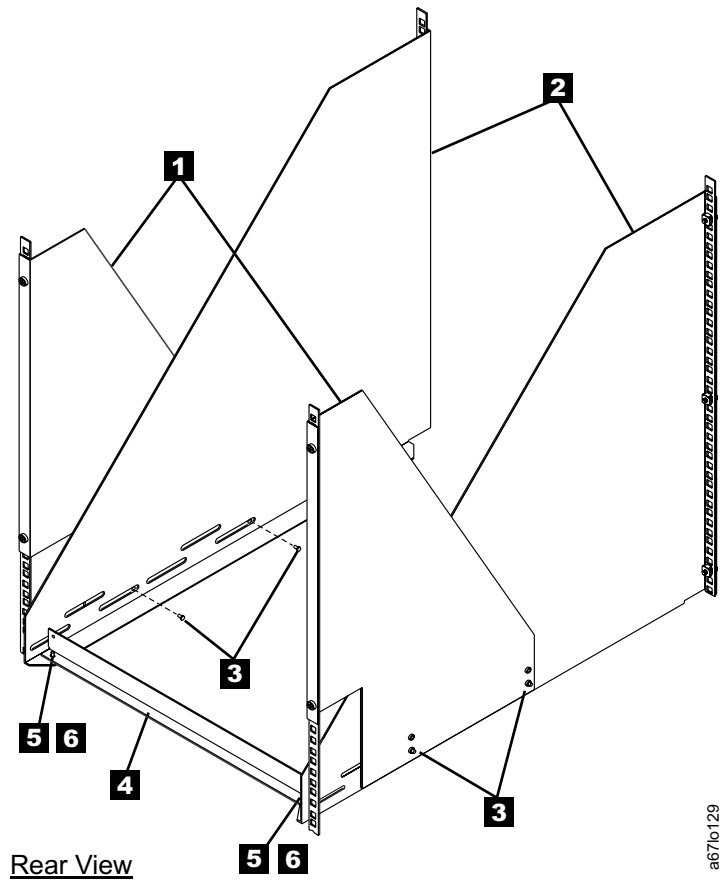
Figure 20. Installing the rear stop bracket

Placing the Library Into the Rack
Required tools (not supplied): Phillips screwdriver and a 3/8-in. wrench

Note: **When the library is secured in the rack you will not be able to see the serial number label located on the lower left corner on the back of the library. Locate the serial number label and record the serial number for future reference.**

**> 55 kg
(121.2 lb)**

CAUTION:
The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes four people with a lifting device to safely lift this part or unit.

1. Open the front door (see **1** in Figure 21) by inserting the key into the keylock **2** and turning it to the right.
2. Remove the band **3** that secures the picker assembly **4** to the frame.
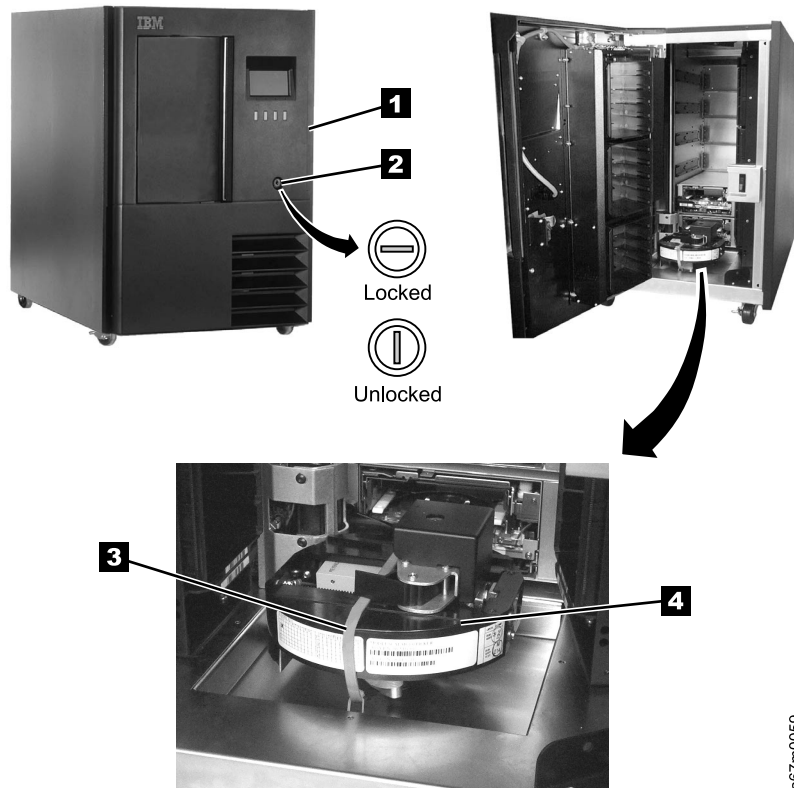
Figure 21. Removing the band that secures the picker

3. Remove all of the cartridges **1** and magazines **2** from the storage columns within the library (see Figure 22). To remove a magazine, grasp the tabs at its corners and pull the magazine toward you.

4. Close the front door securely.
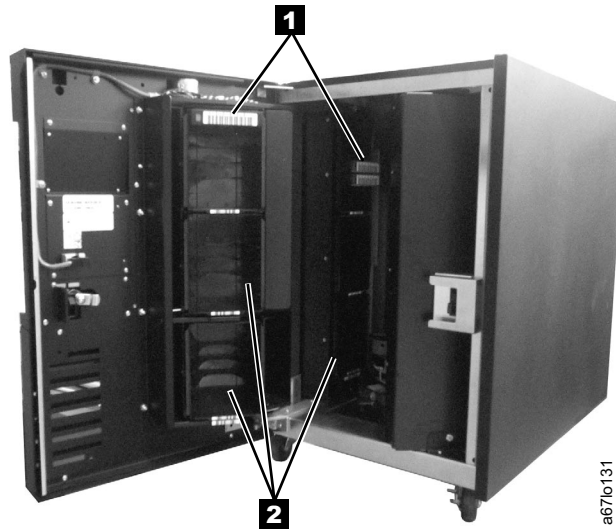
Figure 22. Removing cartridges and magazines

5. To reduce its weight, remove all drive sleds and dc power supplies that are installed in the library. Note the position of the drive sleds as you remove them; you will need to replace them in the same positions. Loosen the captive thumbscrews **1** and slide the drive sled **2** and dc power supply **3** out of the chassis (see Figure 23).
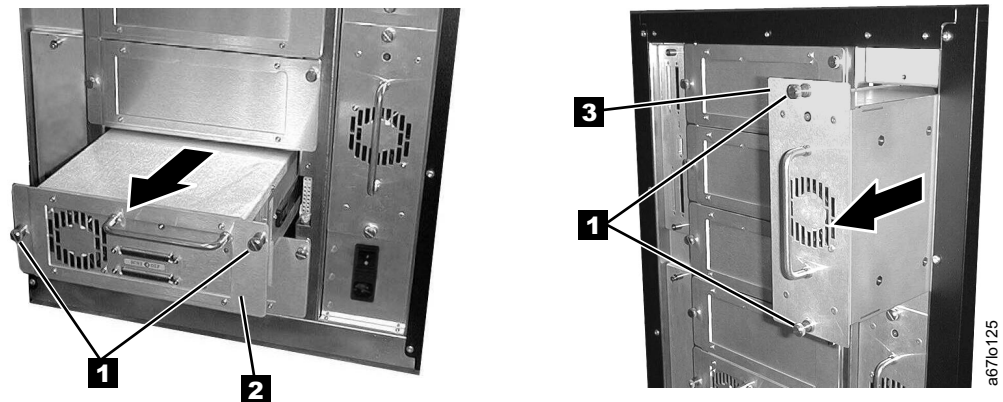
Figure 23. Removing the drive sleds and the DC power supplies. The figure shows an Ultrium 1 Tape Drive on the sled.

Note: For the next procedure, use the sling to place the library onto its side.

6. Remove the four casters (**2** and **4** in Figure 24 on page 46) from the bottom of the library. Use a 3/8-in. wrench to remove the bolts **1** that secure each caster to the frame (there can be up to four bolts).
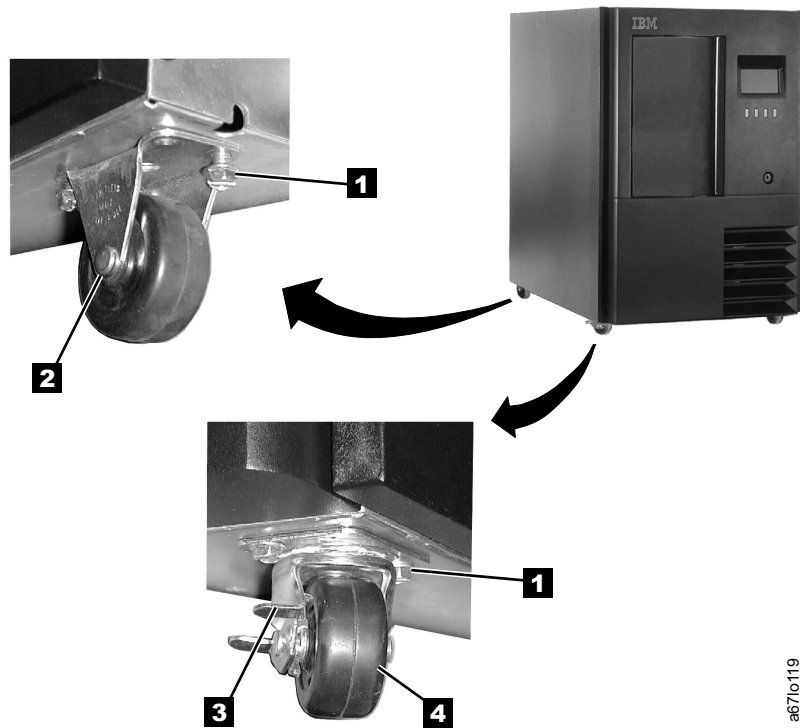
Figure 24. Removing the casters

7. Return the library to its upright position.

Note: In the step that follows, open the front door (see **4** in Figure 25) completely before removing the side covers.

8. Remove the four Phillips screws **1** that secure each side cover **2**, then remove both side covers.

9. From the front of the rack, use the handles **3** located on both sides of the library to lift the library onto the rackmount hardware.
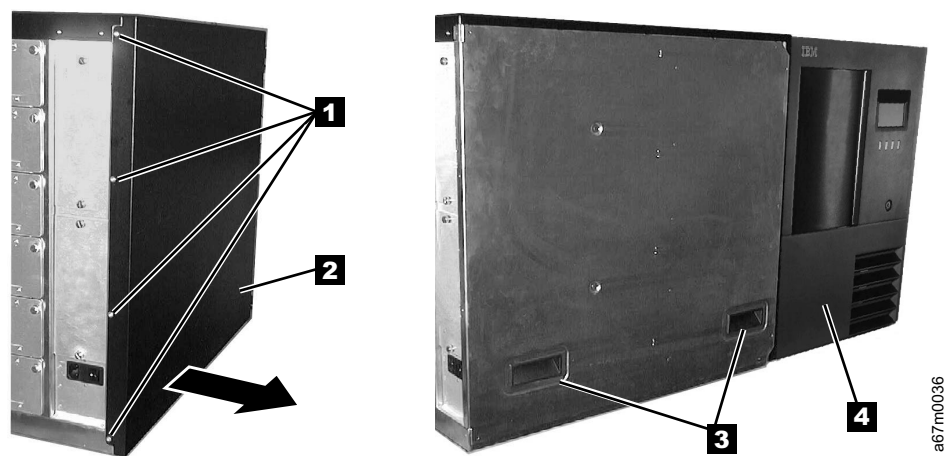
Figure 25. Removing the side covers

10. Slide the library (**1** in Figure 26) onto the rackmount hardware until it stops against the rear stop bracket **3** . Using the two Phillips screws **2** , attach the library to the rear stop bracket **3** . This ensures that the library is secured to the rack and is properly grounded.
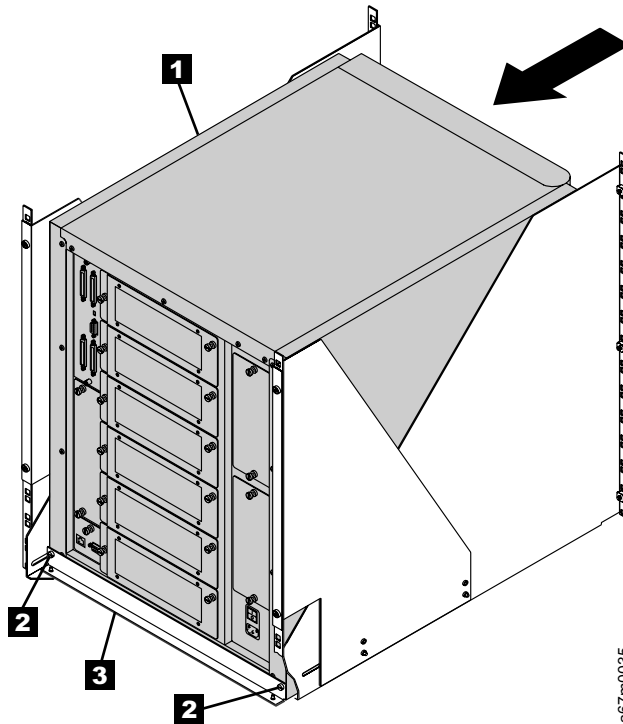
Figure 26. Placing the library into a rack

11. Use the following steps to install the drive sleds that you removed in step 5 on page 45.

   a. From the rear of the library, locate the drive slot where you want to install a drive sled.

   b. Slide the drive sled **2** into position and tighten the two captive thumbscrews **1** (see Figure 27).
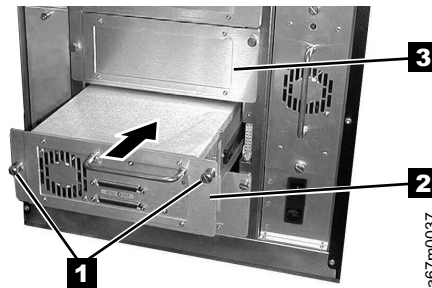
Figure 27. Installing a drive sled

DANGER

Up to 240 V ac is present at the power supply connectors when the main power cord is connected to a power source.
(RSFTD010)

12. Use the following steps to install the dc power supplies that you removed in step 5 on page 45.

   a. From the rear of the library, locate the slot where you want to install the dc power supply.

      Note: Before inserting the dc power supply, be sure to orient the power supply so that the light-emitting diode (LED) **3** is located as shown in Figure 28.

   b. Slide the dc power supply **1** into position until it mates with the power distribution board and tighten the two captive thumbscrews **2** .
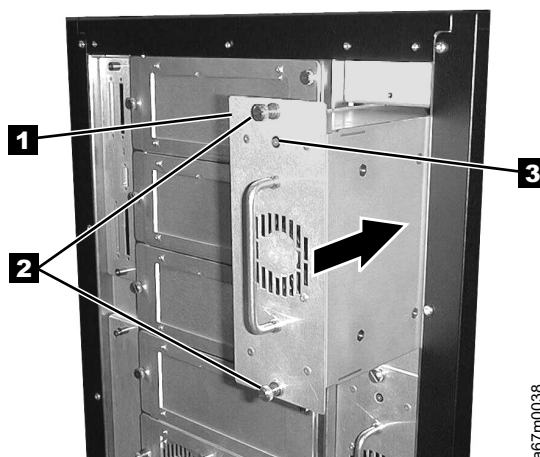
Figure 28. Proper orientation of the dc power supply

13. Reinstall the magazines and cartridges that you removed in step 3 on page 45.

14. If you intend to install one or more optional features, go to "Step 3. Installing Optional Features" on page 49. Otherwise, go to "Step 4. Attaching the Cables" on page 57.

Step 3. Installing Optional Features

If you are not installing an optional feature, go to "Step 4. Attaching the Cables" on page 57.

If you ordered one or more optional features, install them now. Refer to Table 10 to find the correct procedure.

Note: Except for the redundant dc power supply and the Multi-Path feature, the customer is responsible for installing all optional features.

Table 10. Optional Features

To install...	Go to page...
Ultrium 2 Tape Drive with 2-Gb Fibre Channel interface (feature code 8105)	50
Ultrium 2 Tape Drive with Low Voltage Differential (LVD) Ultra160 SCSI interface (feature code 8103)	50
Ultrium 2 Tape Drive with High Voltage Differential (HVD) Ultra SCSI interface (feature code 8104)	50
Ultrium 1 Tape Drive with LVD Ultra2 SCSI interface (feature code 8003)	50
Ultrium 1 Tape Drive with HVD Ultra SCSI interface (feature code 8004)	50
Redundant dc power supply (feature code 8008)	52 Must be installed by a trained IBM Service Representative
SAN Data Gateway Module (feature code 8005)	54
12-slot I/O station (feature code 8012)	55
18-slot tape storage column (feature code 8007)	56
6-cartridge magazine with cover (feature code 8013)	51
Rackmount kit (feature code 8006)	36
Control path failover (feature code 1680)	188
Multi-path feature to upgrade existing library (feature code 1450)	Must be installed by a trained IBM Service Representative

Installing a Drive Sled

When installing drive sleds for SCSI and Fibre Channel Tape Drives in the Ultrium Scalable Tape Library, you must insert the first sled in the bottom drive slot (slot 1). Add subsequent sleds directly above the last sled that is installed, from bottom to top (slots 2, 3, 4, 5, 6) with no empty slots (see Figure 29).

If you use partitioning, refer to "Partitioning the Library" on page 139 for guidelines.
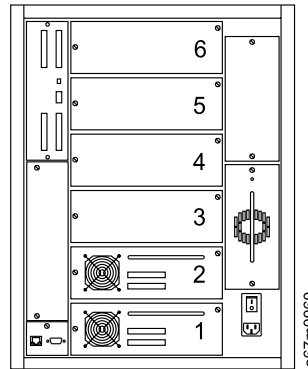
Figure 29. Correct order for installing drive sleds

Drive sleds that are attached to the same SCSI server must be installed next to each other in the library or the drive-to-drive cables may not reach. For example, if the library uses LVD, HVD, and Fibre Channel drives, all drive sleds that attach to these drives must be together. If there is more than one server for the LVD, HVD/DIFF, or Fibre Channel drive sleds, the sleds that attach to the same server must be installed together.

Note: The Ultrium Scalable Tape Library consists of up to seven SCSI devices: the library and up to six drives. The default settings for the SCSI IDs are 6 for the library and 0 through 5 for the drives. Depending on your requirements, you may need to change the default SCSI ID settings for your installation (see "Viewing or Changing a Drive's SCSI ID" on page 166 or "Viewing or Changing a Loop ID" on page 169).

1. Use the server to set the library and the drives Offline for all attached servers.
2. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 78 on page 96).
3. From the rear of the library, locate the drive slot where you want to install the drive sled. Loosen the two captive thumbscrews on the filler plate and remove the filler plate (see **1** in Figure 30 on page 51 or Figure 31 on page 51). Save the filler plate for future drive maintenance activity.
4. Slide the tape drive sled **2** into position and tighten the two captive thumbscrews.
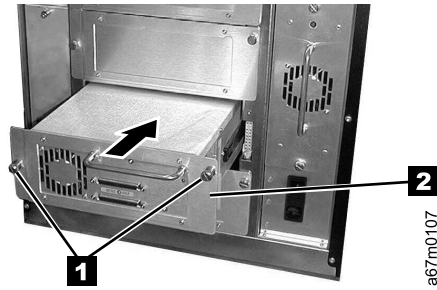
Figure 30. Installing a drive sled that contains an Ultrium 1 Tape Drive
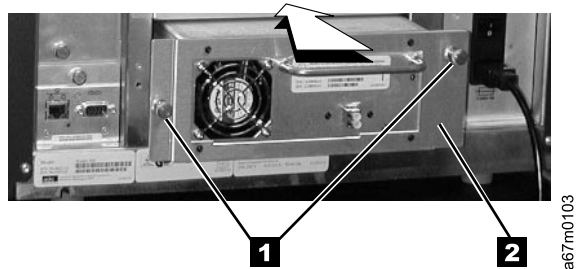
Figure 31. Installing a drive sled that contains an Ultrium 2 Tape Drive

5. Install any additional optional features (see "Step 3. Installing Optional Features" on page 49). Otherwise, go to "Step 4. Attaching the Cables" on page 57.

Installing a 6-Cartridge Magazine

1. Open the door of the library.
2. Grasp the sides of the magazine and press it into one of the magazine slots.
3. Close the front door.

Installing a Redundant dc Power Supply

DANGER

Up to 240 V ac is present at the power supply connectors when the main power cord is connected to a power source.
(RSFTD010)

1. Verify that the correct dc power supply is currently installed in the library by locating the dc power supply at the rear of the library (see **1** in Figure 32 and examining it for a label:
   - If the new power architecture (NPA) label **2** is present, the redundant dc power supply must also bear the NPA label.
   - If the NPA label is not present, the redundant dc power supply must not bear the NPA label.
   - If the labels on the dc power supplies do not match, do not continue with this installation. Contact your IBM Business Partner or IBM Marketing Representative to order the correct dc power supply.
   - If the labels on the dc power supplies match, go to step 2 to continue the installation.

   Note: The presence of the NPA label indicates that the Ultrium Scalable Tape Library contains a new power architecture and requires a new level of dc power supply. The library will not operate properly if the power supplies and power architectures are not at the same level.
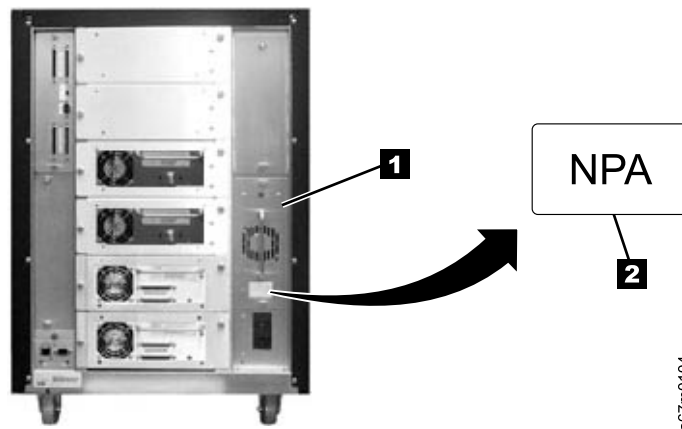
Figure 32. Installing a redundant dc power supply

2. Locate the slot where you want to install the redundant dc power supply. Loosen the two captive thumbscrews on the cover plate and remove the cover plate (see Figure 33 on page 53).

   Note: Before inserting the dc power supply, be sure to orient the power supply so that the LED **3** is located as shown in Figure 33 on page 53.

3. Slide the power supply (**1** in Figure 33 on page 53) into position until it mates with the power distribution board and tighten the two captive thumbscrews **2**.

4. Inspect the rear panel to ensure that all LEDs are green. If all LEDs are green, the installation is complete. If any LEDs are not green, contact your Service Representative.

5. Install any additional optional features (see step "Step 3. Installing Optional Features" on page 49). Otherwise, go to "Step 4. Attaching the Cables" on page 57.
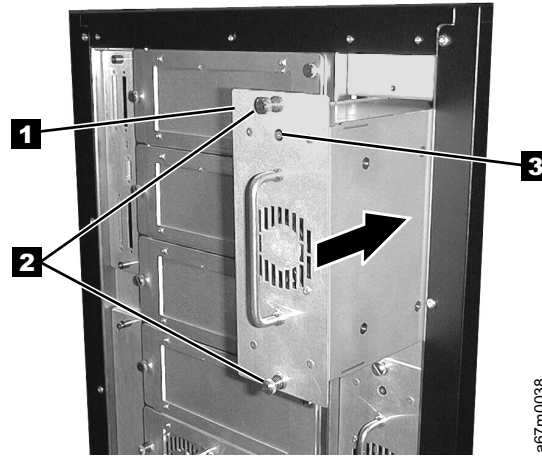
Figure 33. Installing a redundant dc power supply

Installing a SAN Data Gateway Module

The SAN Data Gateway Module enables the SCSI protocol to be converted to Fibre Channel protocol. The following procedure applies only to libraries that do not have native Fibre Channel connections.

1. From the rear of the Ultrium Scalable Tape Library, locate the dc power supply (see **3** in Figure 34) and examine it for a label:

   a. If the NPA label **4** is present, proceed with the installation of the SAN Data Gateway Module.

   b. If the NPA label **4** is not present, the library does not have the required power architecture to support the SAN Data Gateway Module. Do not continue with this procedure. Contact your IBM Business Partner or IBM Marketing Representative to order the necessary parts.

2. Use the server to set the library and drives Offline for all attached servers.
3. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 78 on page 96).
4. From the rear of the library, locate the slot where you want to install the gateway (see Figure 34). Loosen the two captive thumbscrews on the cover plate and remove the cover plate.
5. Slide the gateway into position (see **1** in Figure 34) and tighten the two captive thumbscrews **2**.
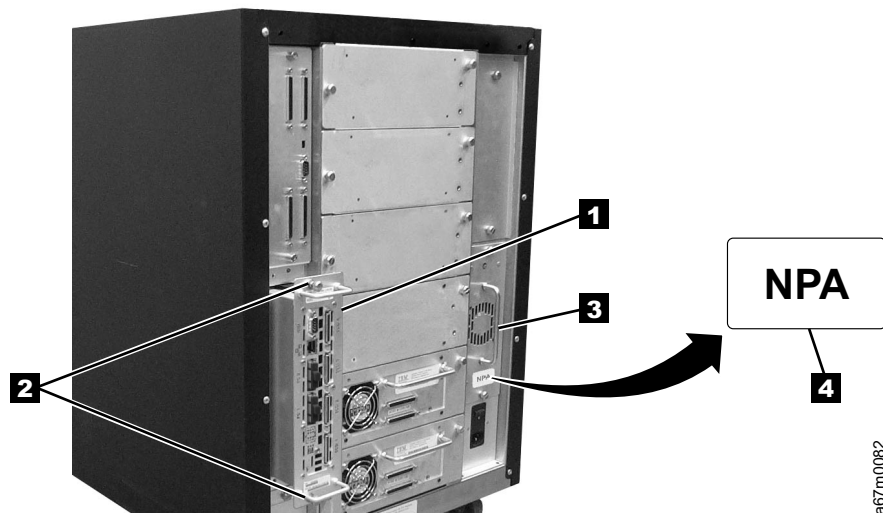
Figure 34. Installing a SAN Data Gateway Module

6. Install any additional optional features (see step "Step 3. Installing Optional Features" on page 49). Otherwise, go to "Step 4. Attaching the Cables" on page 57.

   Note: After you have completed the installation of the library, go to the installation section in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* to configure the gateway for use. IBM does not supply the fiber cable for this installation. To order the appropriate fiber cable, contact your IBM Business Partner or IBM Marketing Representative.

Installing a 12-Slot I/O Station

Required tools (not supplied): T20 Torx driver and a 11/32-in. nut driver.

1. Use the server to set the library and drives Offline for all attached servers.
2. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 78 on page 96).
3. Open the library's front door.
4. If present, remove the cartridge from the single-slot I/O station.
5. Remove the four I/O station cable clamps (see **1** in Figure 35). Three of the cable clamps are attached to the door with a T20 Torx screw, and one is attached with a 11/32-in. nut.
6. Disconnect the I/O station cable connector **7** from the display assembly **2**.
7. Remove the eight 11/32-in. nuts **6** (four on each side) that secure the I/O station assembly to the front door.
8. Remove the single-slot I/O station.
9. The 12-slot I/O station is installed the same way as the single-slot I/O station. Perform the above steps in reverse order to install the 12-slot I/O station.
10. Insert two magazines **4** in the I/O station and one magazine **5** in the fixed location below the I/O station magazines.
11. Install any additional optional features (see step "Step 3. Installing Optional Features" on page 49). Otherwise, go to "Step 4. Attaching the Cables" on page 57.
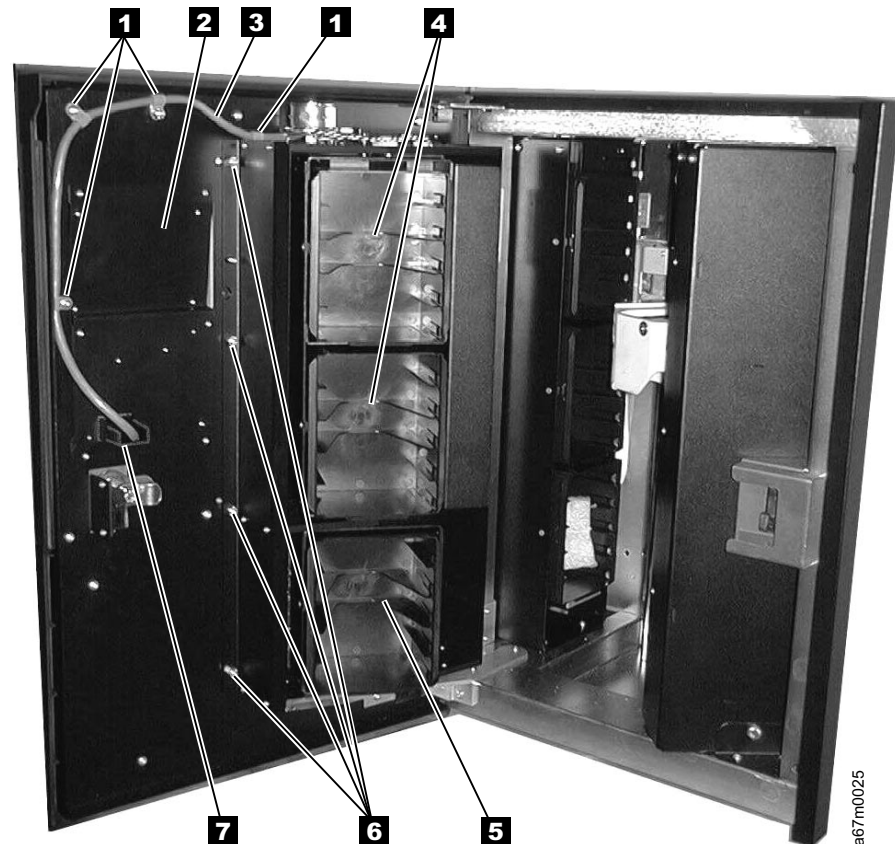
Figure 35. Installing the 12-slot I/O station

Installing a Storage Column

Required tools (not supplied): 11-mm or 7/16-in. nut driver, allen wrench, and flashlight (optional).

1. Use the server to set the library and drives Offline for all attached servers.

2. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 78 on page 96).

3. Open the library's front door.

4. If necessary, move the picker assembly to a position in the Y-axis to allow access room and gently slide the storage column in place.

5. Depending on the column that you are installing, perform one of the following steps:

   a. If you are installing column **4**, use the allen wrench to tighten the two bottom hex screws **5** that attach the storage column to the bottom chassis (see Figure 36).

   b. If you are installing column **5**, use the 7/16-in. nut driver to tighten the bolt **3** that attaches the storage column to the bracket.

6. Install the top bolt **1** by using the 7/16-in. nut driver.

7. Install the magazines **2** in the storage column.

8. Install any additional optional features (see step "Step 3. Installing Optional Features" on page 49). Otherwise, go to "Step 4. Attaching the Cables" on page 57.

Top Attachment for all Storage Columns
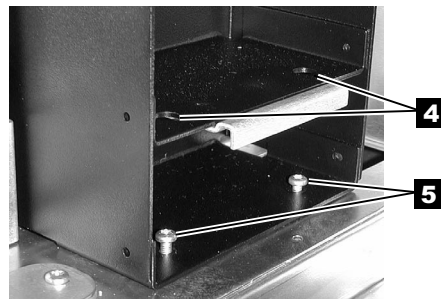
Bottom Attachment for
Storage Columns 2 and 4
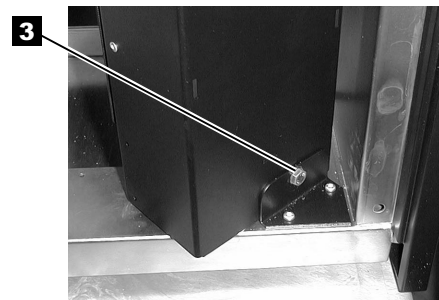
Bottom Attachment for
Storage Column 5

Figure 36. Installing a storage column

Step 4. Attaching the Cables

Perform one of the following:

- If you are installing a standard SCSI tape library with the Multi-Path feature, go to "Making Host-to-Drive Connections with a SCSI Interface".
- If you are installing a standard SCSI tape library without the Multi-Path feature, go to "Making a Host-to-Drive Connection Without the SCSI Multi-Path Feature" on page 59.
- If you are installing a tape library with native Fibre Channel connections, go to "Making Host-to-Drive Connections with Native Fibre" on page 61.
- If you are installing a tape library that has an optional SAN Data Gateway Module, go to "Making Host-to-Drive Connections with the SAN Data Gateway Module" on page 62.

Making Host-to-Drive Connections with a SCSI Interface

Note: Although the LVD hardware in the library is capable of operating in single-ended (SE) mode, SE operation is not recommended or supported.

The library supports SCSI LVD and HVD attachments by using SCSI cables with 68-pin, D-connectors. SCSI adapters must be properly terminated.

Before installing the SCSI cables, inspect all cables for damage. Do not install a cable if it is damaged. Report the damage immediately by contacting your place of purchase.

The maximum allowable length of your bus cabling depends on the type of SCSI bus that you use (LVD or HVD). For LVD, the maximum length is 25 m (82 ft) if one device is attached, and 12 m (40 ft) if more than one device is attached. For HVD, the maximum length is 25 m (82 ft). The following guidelines ensure compliance with the maximum allowable bus lengths:

- For a server with an LVD SCSI bus:
  - Use a maximum system-to-device cable length of 10 m (33 ft) when attaching to the host interface board (SCSI) and one or two daisy-chained drives.
  - Use a maximum system-to-device cable length of 5 m (17 ft) when attaching to the host interface board (SCSI) and three to six daisy-chained drives.
  - Only use the maximum system-to-device cable length of 25 m (82 ft) when attaching directly to one device (a point to point interconnection).
- For a server with an HVD SCSI bus:
  - Use a maximum system-to-device cable length of 20 m (65 ft) when attaching to the host interface board (SCSI) and one to six daisy-chained drives.
  - Only use the maximum system-to-device cable length of 25 m (82 ft) when attaching directly to one device (a point-to-point interconnection).

The sections that follow describe how to make host-to-drive connections with and without the Multi-Path feature.

Making a Host-to-Drive Connection With the SCSI Multi-Path Feature

To make a host-to-drive connection with the SCSI Multi-Path feature and two servers (hosts):

1. Attach the first host cable (**1** in Figure 37) to the lowest available drive in the logical library.

2. If attaching to the next device in a chain, connect the cable **2** to the other SCSI connector **3** on the drive.

3. Insert a SCSI terminator **4** . **Make sure that you use the terminator and not the wrap tool. They look very similar. You can tell the difference by their part numbers, which are stamped on each.**

4. Attach a second host cable **5** to one of the SCSI connectors on Drive 3 and terminate the remaining connector **6** .
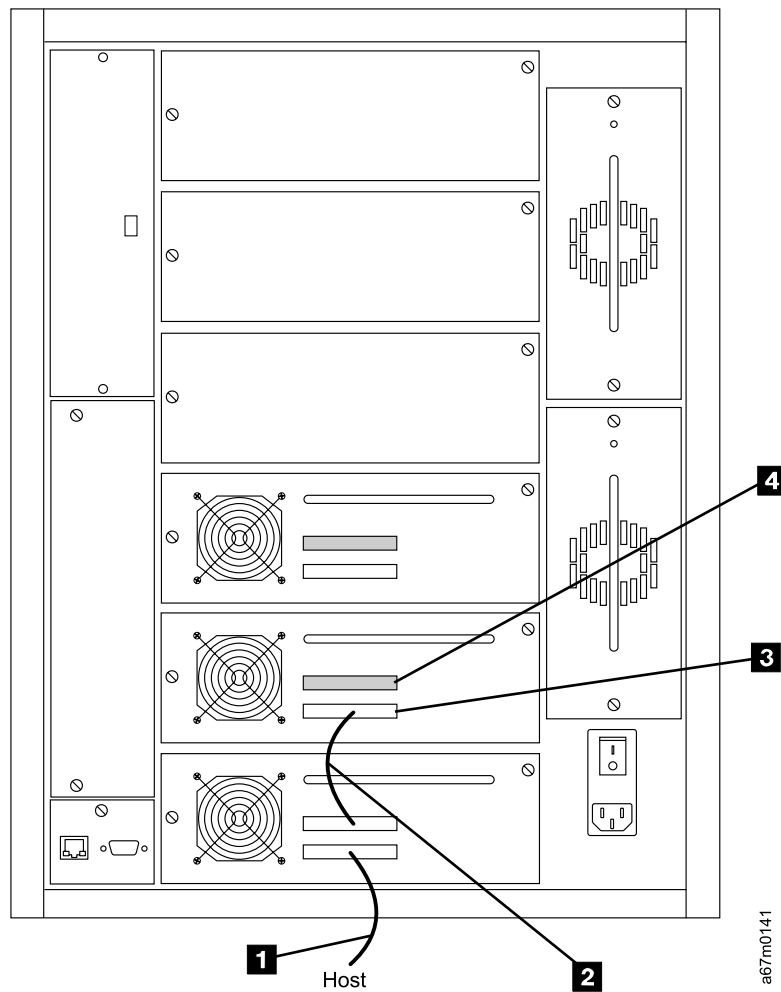
Figure 37. Making the host-to-drive connections with the SCSI Multi-Path feature and two hosts

Making a Host-to-Drive Connection Without the SCSI Multi-Path Feature

To make a host-to-drive connection without the SCSI Multi-Path feature:

1. Refer to SCSI host interface board (see Figure 38) and determine whether you intend to attach to the HVD connector **1** or the LVD connector **2** . You can attach to and use only one of the SCSI types on the host interface board. All devices on the bus with the SCSI host interface board must be the same SCSI type (HVD and LVD cannot be mixed on the same bus).

2. Set the switch **3** for the SCSI type you will be using. Using a small-blade screwdriver, move the switch to the up position for HVD, or to the down position for LVD.

3. Attach the host cable **4** to the SCSI host interface board according to the LVD or HVD configuration that you want.

4. Run the cable **5** from the host to the SCSI connector **6** on the drive.
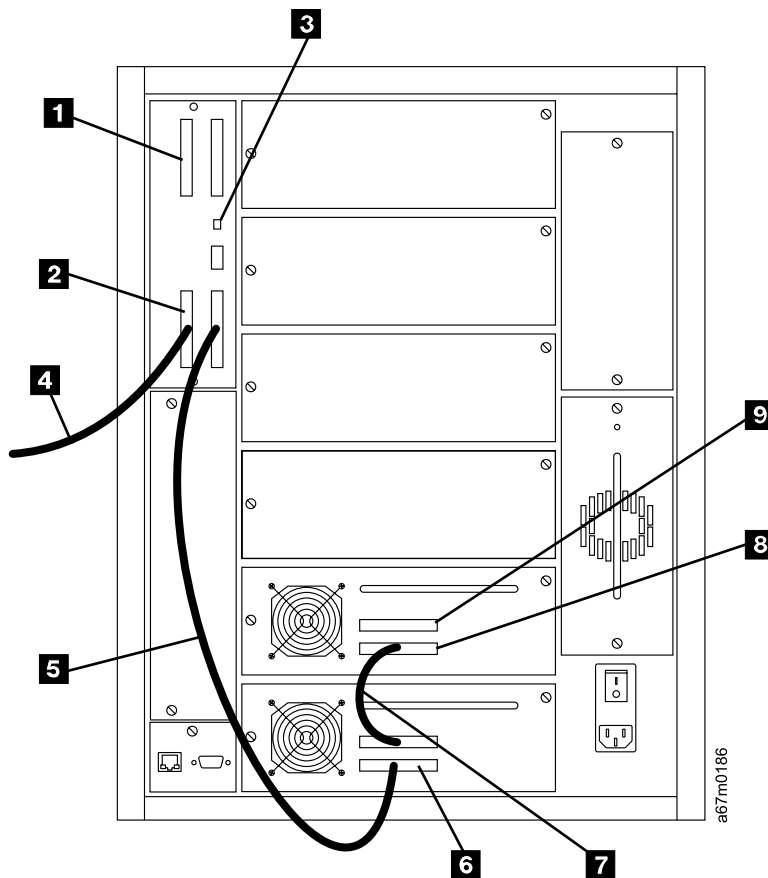
Figure 38. Making the host-to-drive connections without the SCSI Multi-Path feature

5. If attaching to the next device in a chain, connect the cable **7** to the other SCSI connector **8** on the drive.

6. Insert a SCSI terminator **9** . **Make sure that you use the terminator and not the wrap tool. They look very similar. You can tell the difference by their part numbers, which are stamped on each.**

Making Host-to-Drive Connections with Native Fibre

Note: The Multi-Path feature is a prerequisite to having Fibre Channel drives in the Ultrium Scalable Tape Library.

To connect to the host by using a native Fibre Channel connection, attach the host cables (**1** in Figure 39) to the LC connectors **2** of the Ultrium 2 Tape Drives that you want.

Figure 39. Making the host-to-drive connections with native Fibre Channel

Making Host-to-Drive Connections with the SAN Data Gateway Module

Note: IBM does not supply the fiber optic cable for this procedure. To order the appropriate fiber cable, contact your IBM Business Partner or IBM Marketing Representative.

IBM recommends that you use a fiber cable with 50-micron core fiber.

Before installing the fiber and SCSI cables, inspect all cables for damage. Do not install a cable if it is damaged. Report the damage immediately by contacting your place of purchase.

Figure 40 shows examples of the Fibre Channel and SCSI connectors.

1	LC Fibre Channel connector	**4**	HD68 SCSI connector
2	SC Fibre Channel connector	**5**	VHDCI SCSI connector
3	SC-to-LC Fibre Channel interposer		
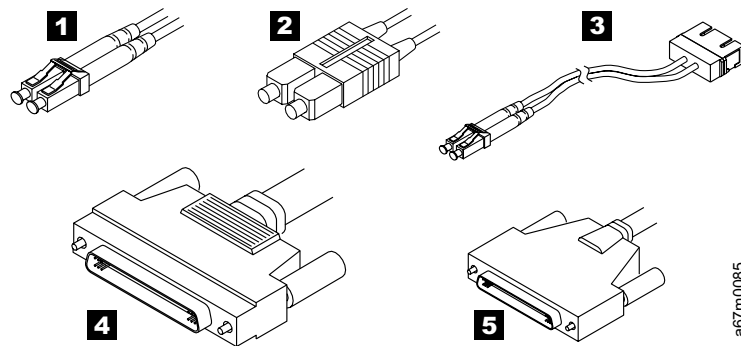
Figure 40. Cable connectors

Connecting the Fiber Cable from the Host to the Library

Attach the fiber cable from the host (server) to the GBIC of one of the Fibre Channel connectors on the gateway (**1** in Figure 41 on page 64).

Note: The short-wave, multimode GBICs that are installed in the gateway are SC-style and are capable of 2-Gbit speeds. They automatically switch to a 1-Gbit speed if attached to a 1-Gbit system. The installed GBICs support a maximum cable length of 300 m (984 ft) at 2-Gbit speeds and 500 m (1640 ft) at 1-Gbit speeds. If you are attaching to a server that has an LC-style connector, you will need to use an SC-to-LC fiber optic cable, or an SC-to-SC cable and an LC-to-SC interposer.

Connecting the SCSI Cables from the Library to the Drives

Because the SCSI ports on the gateway are LVD, use only the LVD connections on the library' SCSI host interface board and LVD drives. Figure 41 shows examples of SCSI cable connections with three drives and six drives installed. The host cable is shown as **1**.

Note: The cabling configuration may affect performance.
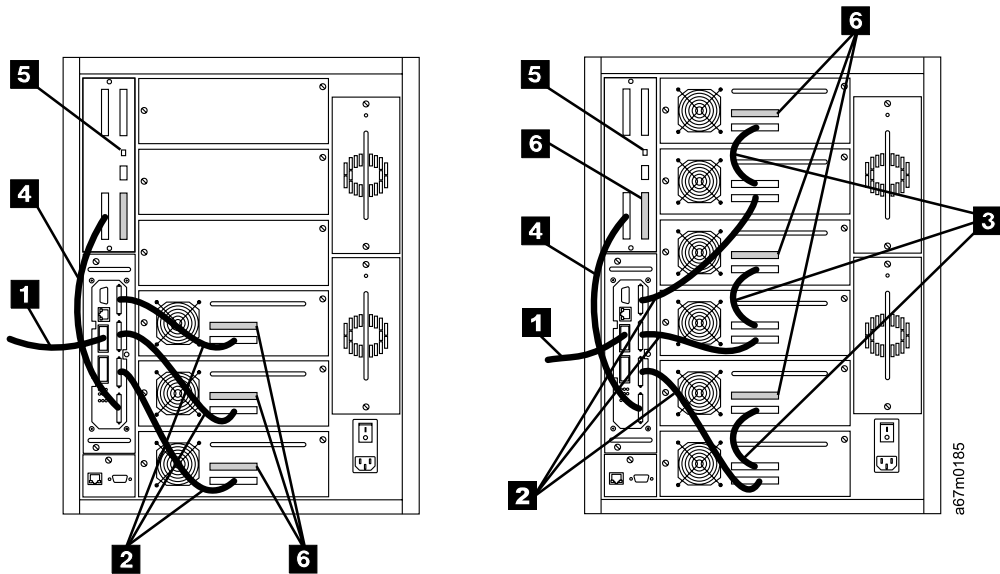
Figure 41. Example of cabling with three or six drives installed. The library with three drives is on the left; the library with six drives is on the right.

1. Attach the SCSI cables **2** from the drives to the SCSI ports of the gateway. (Four 0.6-m VHDCI-to-HD68 SCSI cables are provided with each library. If your library is installed with more than four drives, daisy-chain the drives by using HD68-to-HD68 cables **3** .)
2. Attach one of the LVD connectors on the library's host interface board to a SCSI port on the gateway by using one of the 0.6-VHDCI-to-HD68 cables **4** .
3. Ensure that the switch **5** on the host interface board is set to select the LVD set of connectors.

   Note: Do not connect the gateway to the HVD set of connectors on the host interface board.
4. Install a terminator **6** on the last SCSI device on each SCSI bus. Each of the four gateway SCSI ports is a separate SCSI bus. Each one must be terminated at the last device on the bus.

   Note: Ensure that you are using an LVD terminator. Also, IBM provides a terminator for each drive and the library.
5. Go to "Step 6. Turning on the Power" on page 65 to continue the installation of the library.

Step 6. Turning on the Power

⚠️ **Attention:** Before turning on the power, make sure that qualified personnel verify the proper voltage at the outlet. If the voltage is incorrect, damage to the power supply could occur.

1. Ensure that the power switch is set to off by pressing O on the power switch (see **1** in Figure 42).
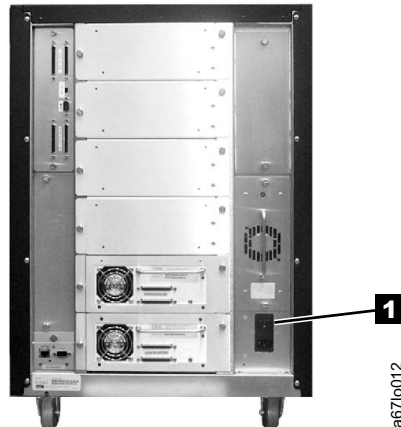
Figure 42. Main power switch

2. Plug the power cord into the Ultrium Scalable Tape Library, then plug the other end into a grounded electrical outlet.

3. Check the write-protect switch on the data cartridge (scratch cartridge) that was shipped with the library (see **1** in Figure 43 on page 66). Ensure that it is set so that data can be written to the tape (see "Setting the Write-Protect Switch" on page 250).

4. Open the front door and place the data cartridge into the single-slot I/O station (not shown) or into the top slot of the 12-slot I/O station **2**.
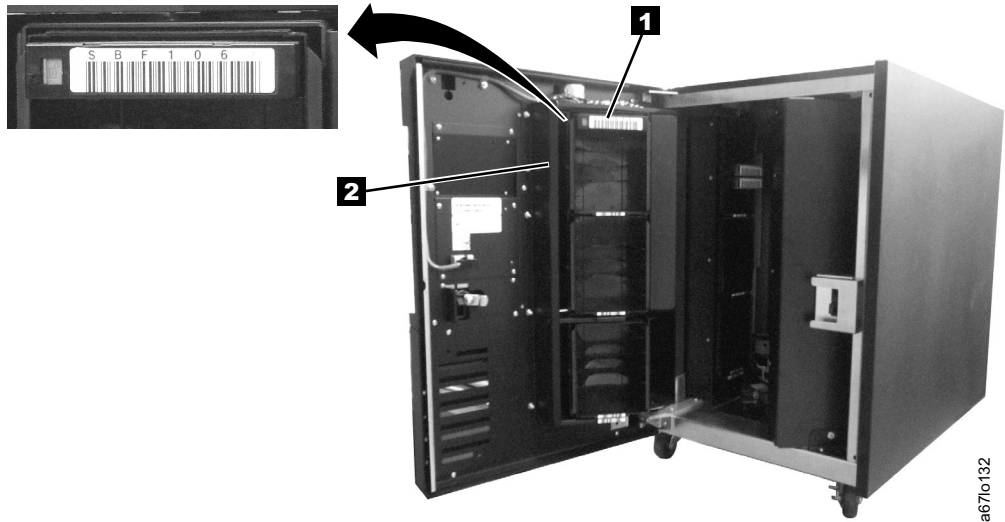
Figure 43. Inserting a data cartridge

5. Close the front door securely.

6. Push | on the power switch to turn on the power. The library takes a few minutes to perform initialization.

7. Inspect the rear panel to ensure that all LEDs are green. If all LEDs are green, proceed with the installation. If any LEDs are not green, contact your Service Representative.

8. The library firmware automatically initializes and starts the inventory/teach process. When the Main Menu displays on the operator panel (**1** in Figure 44), place the library in the Offline state by pushing the button **2** below the **Online/Offline** softkey. Follow the instructions on the screen, then push the button **2** below the **OK** softkey.
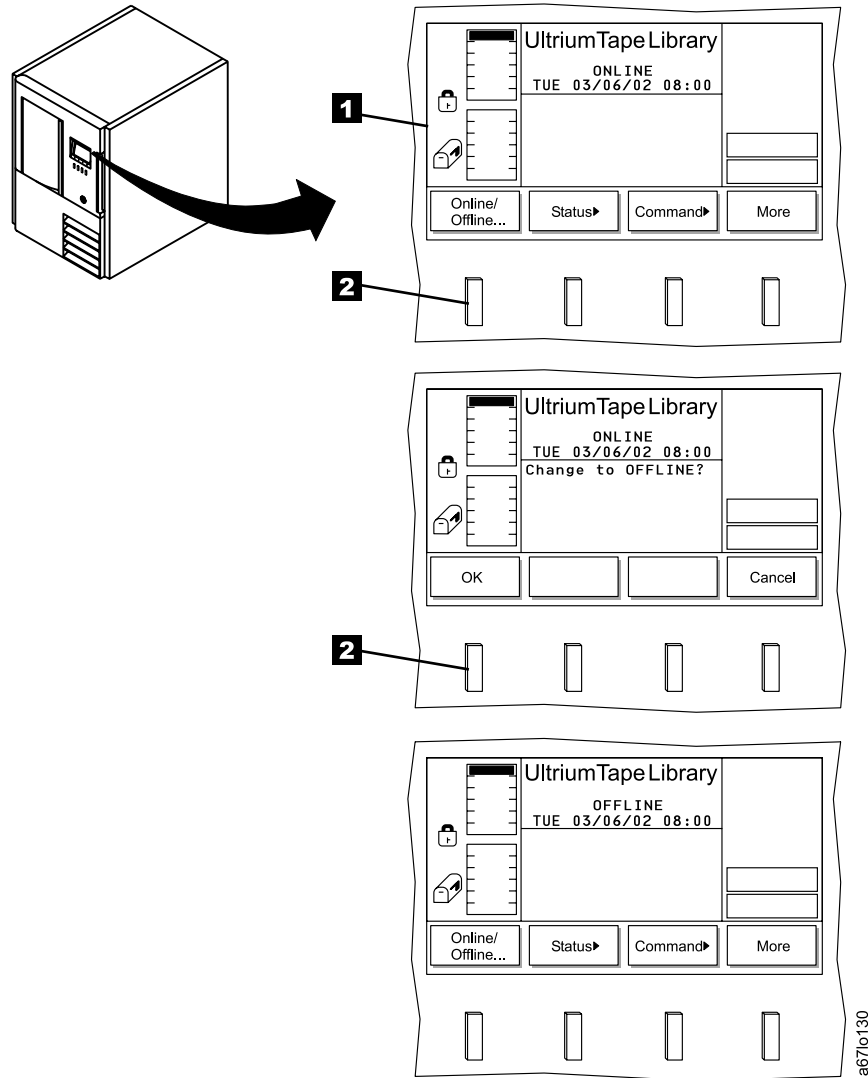
Figure 44. Operator panel

9. Run the FAST Read/Write test for each drive that is installed.

   a. From the operator panel select **More** by pushing the button below the **More** softkey.

   b. Select **Service**, then **Drives**. The Select Drive Dialog displays (see Figure 45).
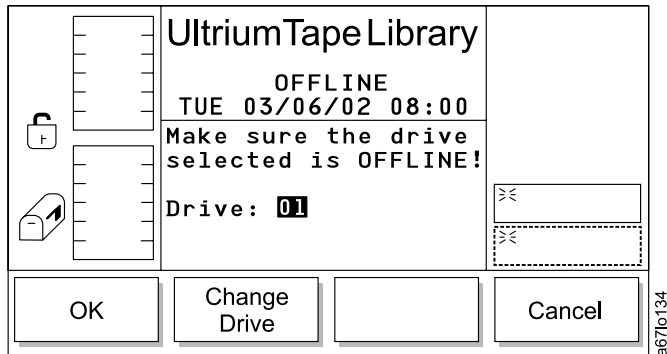
Figure 45. Select Drive Dialog

   c. To run the FAST Read/Write Test on the current drive, select **OK**. To run the test on a different drive, select **Change Drive** until the drive you want displays, then select **OK**, and then **Diags**. The Drive Diagnostics screen displays (see Figure 46).
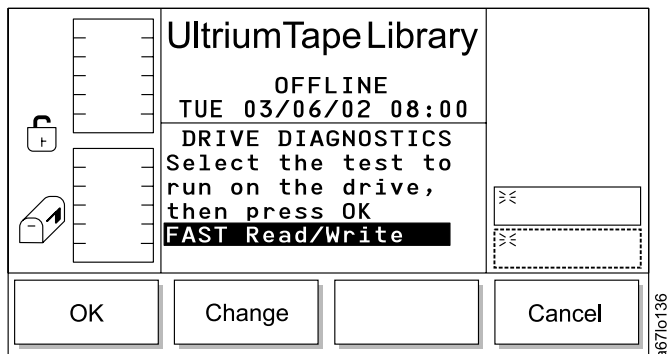
Figure 46. Drive Diagnostics screen

   d. Select **OK**. The FAST Read/Write screen displays (see Figure 47 on page 69).
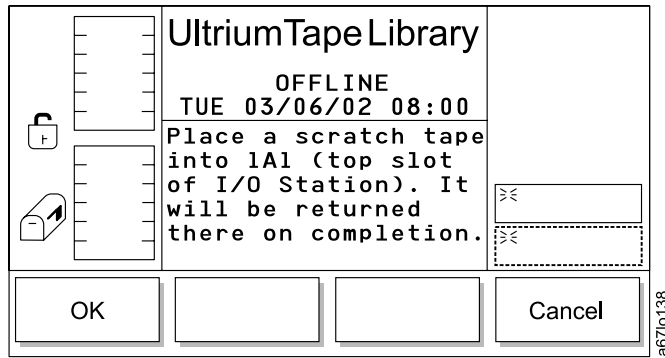
Figure 47. FAST Read/Write screen

e. Select **OK**, and the FAST Read/Write Test begins. The operator panel displays the message `Currently loading the cartridge`, then `Diagnostic now in progress`, then `Currently unloading the cartridge`. When the test is complete, the Command Complete screen displays (see Figure 48).
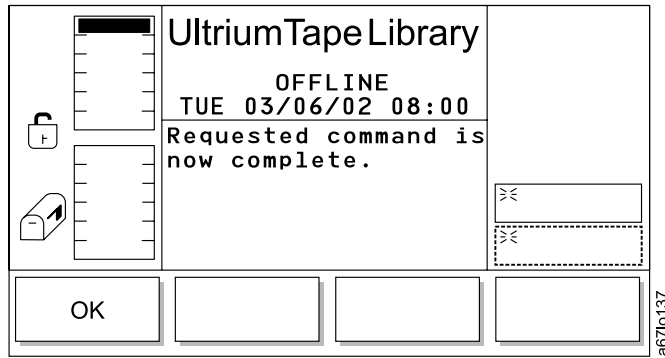
Figure 48. Command Complete screen

f. Repeat step 9 on page 68 for each drive that is installed.

Step 7. Configuring the RMU

The Remote Management Unit (RMU) is a removable circuit board that facilitates access to the web and the TotalStorage Specialist. After you configure the RMU, you can perform all of the library's operator panel operations from a remote site.

To set up the RMU for proper operation, you must enter the RMU network address and hostname (obtain the address and hostname from your system administrator). The RMU network address consists of an IP address, subnet mask, and gateway IP address. The hostname is the name given by your system administrator to the library. After you establish the RMU network address and hostname, you can use a web browser to access the TotalStorage Specialist application. By using the TotalStorage Specialist, you can verify the RMU network address, create accounts, and create passwords. You can also broadcast the RMU network address and hostname to potential RMU users.

To configure the RMU for use, perform the following steps:
1. Review the information in "Operator Panel" on page 79 then press the following push buttons: **Main Menu (initial screen) Setup —> Library —> RMU**. The RMU dialog displays (see Figure 49).

```
UltriumTapeLibrary
          ONLINE
   TUE 03/06/02 08:00
IP   :192.168.080.239
Sub  :255.255.255.000
Gate:192.168.080.001
Name: XXXXXX
```

| Up | Down | Next | Cancel |

Figure 49. RMU Dialog

> **Note:** If the RMU dialog does not display and the operator panel displays the message `Could not establish communication with the RMU board` a problem exists with the RMU connection. Disconnect the RMU from the library by loosening its thumbscrews and pulling it out approximately 7 cm (3 in.). Wait 5 seconds, then reconnect the RMU (you do not have to power-off the library). Return to step 1 and restart the procedure.

2. Use the push buttons below the **Up** or **Down** softkeys to enter the IP address, subnet address, gateway, and name, similar to the example values shown in Figure 49. Press the button below the **Next** softkey to accept the current field and advance to the next field.
3. After you have set the value for each field, press the button below the **OK** softkey to accept the settings and return to the Library menu.
4. Attach an Ethernet cable (**2** in Figure 50 on page 71) with RJ-45 connectors to the RMU **3** and an Ethernet hub **4** that is attached to a computer **5** .

> **Note:** You can also attach a computer, without using an Ethernet hub, directly to the RMU by using a crossover cable (not shown).

When you configure the Ultrium Scalable Tape Library to a network the media access control address (*MAC ID*) that appears on the RMU (see **1** in Figure 50) must match the MAC Address that displays on the Library Status screen of the TotalStorage Specialist (see Figure 51 on page 72). The MAC ID is the RMU's serial number. It appears on the RMU as `RMU S/N: xxxxxxxxxx` (where xxxxxxxxxx equals the serial number); the same number must appear on the Library Status screen of the TotalStorage Specialist, although colons typically separate the characters.
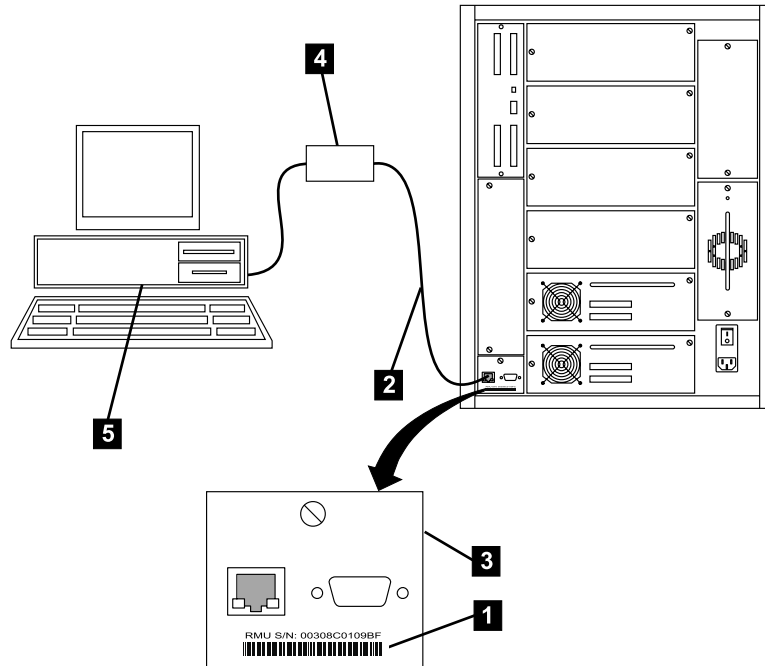
Figure 50. Connecting the RMU to a computer

5. On the terminal of your server, use a web browser to type the IP address or the hostname of the RMU. The TotalStorage Specialist Status page displays (see Figure 51 on page 72).

Figure 51. Status page

6. Select the Configuration tab. The Login page displays (see Figure 52).

Figure 52. Login page

7. Enter the login name and password (the initial login name is `admin` and the initial password is `secure`), then click on Submit. The Configuration page displays (see Figure 53 on page 73). You can now add new users and change the password.

Figure 53. Configuration page

8. Verify that the TotalStorage Specialist functions are operational (see "TotalStorage Specialist Menu Description" on page 84).

Step 8. Configuring the SAN Data Gateway Module (optional)

If you choose to use the library's SAN Data Gateway Module, refer to the instructions for configuring the gateway in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.

Step 9. Setting the SCSI and Loop IDs

Setting the SCSI IDs

The Ultrium Scalable Tape Library consists of up to seven SCSI devices: the library and up to six drives. The **default settings** for the SCSI IDs are 6 for the library and 0 through 5 for the drives. Depending on your requirements, you may need to change the SCSI ID default settings for your installation.

Notes:

1. Do not select an ID that is already in use on the same SCSI bus.

2. Do not select the SCSI ID of the SCSI host adapter card. On the SCSI bus, any initiator (such as a host adapter card) that needs to communicate with the library must have its SCSI ID set from 0 to 7. The SCSI ID of the SCSI host adapter card is usually higher than any device on the SCSI bus. Generally, the SCSI ID for the host adapter is 7.

Setting the SCSI ID of the Library

Note: This procedure is valid only for libraries without the Multi-Path feature.

To determine the existing SCSI ID for the library, perform the following steps:

1. From the library's main menu, select **More** by pressing the button below the **More** softkey.

2. Select **Setup —> Library —> SCSI**. The SCSI dialog screen displays (see Figure 54). The existing ID is the value in the `SCSI ID: CURRENT` field.
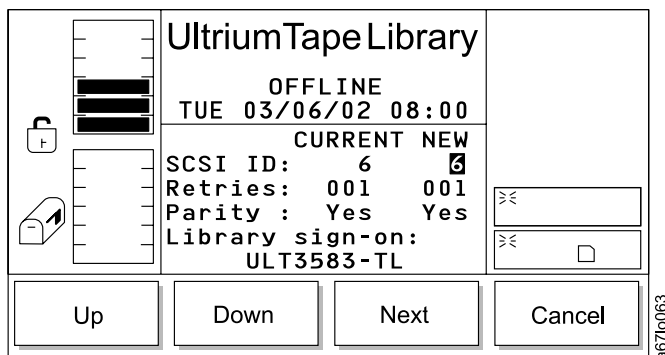
Figure 54. Library SCSI dialog screen

To change the SCSI ID setting for the library, perform the following steps:

1. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the `SCSI ID: NEW` field.

2. Press the button below the **Next** softkey until the **OK** softkey displays.

3. Press the button below the **OK** softkey to accept the new ID.

4. To activate the new SCSI ID, cycle power to the library (turn it off, then on again).

Setting the SCSI IDs of the Drives

To determine the existing SCSI IDs for the drives, perform the following steps:

1. From the Main Menu, select **More** by pressing the button below the **More** softkey.

2. Select **Setup —> Drives —> Loop/SCSI**. The Drive SCSI Dialog screen displays (see Figure 55). The current drive is the value in the `Drive:` field. The existing drive's SCSI ID is the value in the `SCSI ID: CURRENT` field.
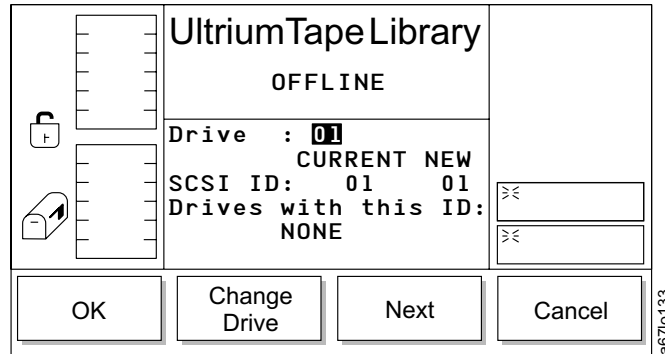
Figure 55. Drive SCSI Dialog

To change the current drive, press the button below the **Change Drive** softkey until the number of the drive you want displays in the `Drive:` field, then select **OK**.

To change the SCSI ID setting for the drive, perform the following steps:

1. Press the button below the **Next** softkey. The Drive SCSI ID Dialog displays (see Figure 56).
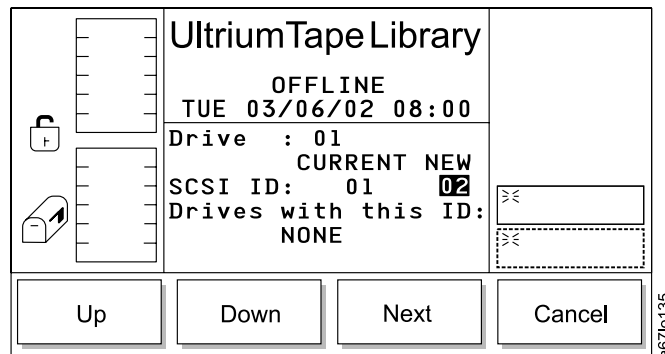
Figure 56. Drive SCSI ID Dialog

2. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the `SCSI ID: NEW` field.

3. Press the button below the **Next** softkey until the **OK** softkey displays.

4. Press the button below the **OK** softkey to accept the new ID.

5. To activate the new SCSI ID, cycle power to the library (turn it off, then on again).

Setting the Fibre Channel Loop IDs

To determine the existing Fibre Channel Loop IDs for the drives, perform the following steps.

1. From the Main Menu, select **More** by pressing the button below the **More** softkey.

2. Select **Setup —> Drives —> Loop/SCSI**. The Loop submenu displays (see Figure 57). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the `Drive:` field. The value of its Loop ID displays in the `LOOP ID: CURRENT` field.

Figure 57. Loop Submenu

To change the current drive, press the button below the **Change Drive** softkey until the number of the drive you want displays in the `Drive:` field, then select **OK**.

To change the Loop ID setting for the drive, perform the following steps:

1. Press the button below the **Next** softkey. The Loop ID Dialog displays (see Figure 58).
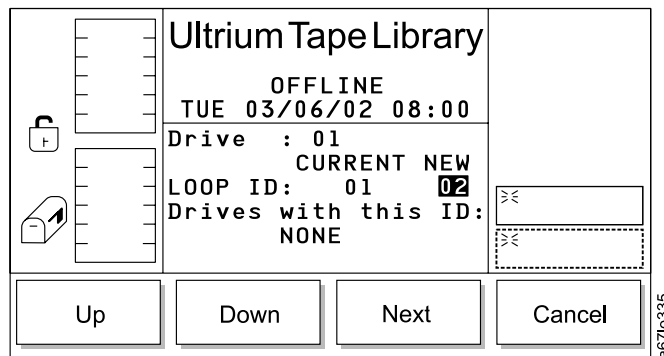
Figure 58. Loop ID Dialog

2. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the `LOOP ID: NEW` field.

3. Press the button below the **Next** softkey until the **OK** softkey displays.

4. Press the button below the **OK** softkey to accept the new ID.

5. To activate the new Loop ID, cycle power to the library (turn it off, then on again).

Step 10. Verifying Firmware Levels

Refer to "Updating Firmware" on page 235 to:

- Ensure that the drives, library, RMU, and optional SAN Data Gateway Module are loaded with the most current firmware
- Ensure that all library components are loaded with the same level of firmware
- If necessary, download and install new firmware

Note: If you choose to update the firmware by using the SCSI bus, you must first install the IBM device drivers (see "Step 11. Installing the SCSI Host Adapter Card (if required)"). Instructions for determining compatible device drivers are given in "Supported Device Drivers" on page 23. If your configuration uses the IBM AS/400 or iSeries server, do not install IBM device drivers (they are already installed).

Step 11. Installing the SCSI Host Adapter Card (if required)

If there are no other devices attached to your server, you may need to install a SCSI host adapter card in the server. To determine whether your server needs an LVD or HVD/DIFF SCSI host adapter card, examine the label between the two SCSI connectors at the rear of the library:

- If ⬨ appears on the label, your server needs an LVD SCSI host adapter card.
- If ⬨ appears on the label, your server needs an HVD/DIFF SCSI host adapter card.

To install an adapter, refer to the instructions that accompany it, as well as to the section about SCSI card installation in the documentation for your server. For a list of supported adapters and required interposers, go to the Technical Support section on the web at `http://www.ibm.com/storage/lto`.

Although the LVD hardware in the Ultrium Scalable Tape Library is capable of operating in the single-ended (SE) mode, SE operation is not recommended or supported.

Step 12. Installing the Device Drivers and Backup Software

A device driver is host firmware that enables the Ultrium Scalable Tape Library to interact with a variety of servers. Install device drivers for the library as follows:

- If you intend to use the library with existing or new commercial backup application software (see "Supported Servers, Operating Systems, and Software" on page 23), refer to that application's installation instructions to install the device driver and to configure the library. IBM recommends that you do not install any device driver from the CD that was shipped with the tape drive. Conflicts could occur over which driver controls the drive. Only install a device driver from the CD if the instructions from your backup application software tell you to do so. Do not install IBM device drivers if your configuration uses the IBM AS/400 or iSeries server; they are already installed.
- If you do not intend to use the library with commercial backup application software, install the device driver from the CD that was shipped with the library. Refer to the installation instructions in the *Ultrium Device Driver Installation and User's Guide*, which is on the CD and also included in published form. The CD contains drivers and installation instructions for the supported operating systems.

Step 13. Configuring the Tape Library to the Server

To configure the Ultrium Scalable Tape Library for use, refer to the documentation for your server and application software.

Post-Installation Considerations

Store the Ultrium Scalable Tape Library's key, manuals, device driver software, and other miscellaneous hardware in a safe location for preventive maintenance or service activity.

Chapter 3. Operator Panel and RMU

You can issue commands to the Ultrium Scalable Tape Library through the server, the operator panel, the RMU, or the optional SAN Data Gateway Module. This chapter describes how to control the library through the operator panel and the RMU.

Operator Panel

The operator panel provides push buttons and a liquid crystal display (LCD) that let you control the Ultrium Scalable Tape Library. By using the push buttons and the messages that appear on the display, you can interact with the library to perform the operations that you want. The operator panel includes the following components:

Each function of the Ultrium Scalable Tape Library is accessible through push buttons on the unit's operator panel (see Figure 59). Figure 73 on page 93 gives a flowchart of the library's functions. Chapter 4, "Operating Procedures", on page 91 describes how to perform each function.

1	I/O station status area		4	Drive status area
2	Library status area		5	Softkeys
3	Message area		6	Push buttons
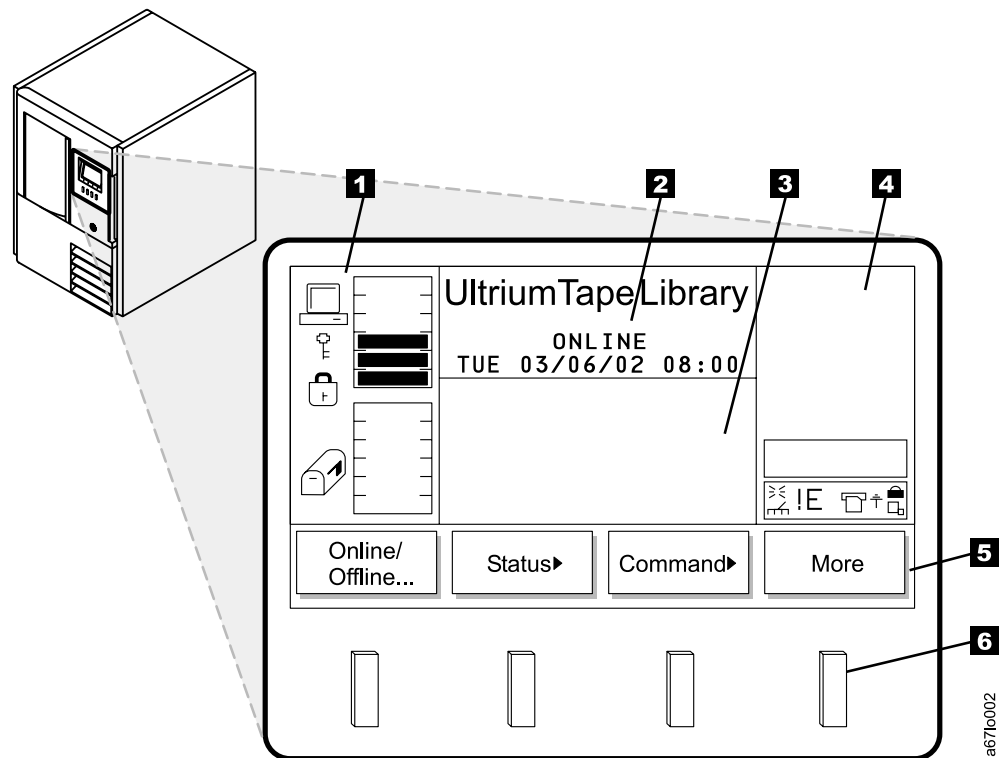
Figure 59. Operator panel

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Most fields on the menus, submenus, dialogs, and screens are read-only. The fields that are writable are highlighted by white characters on a black background. Example: **ON** . To view changes that you made to any menu, reselect the menu that you changed.

I/O Station Status Area

The I/O station status area continually provides information about the I/O station (see **1** in Figure 60). Table 11 on page 81 describes the icons that can display in the I/O station status area.
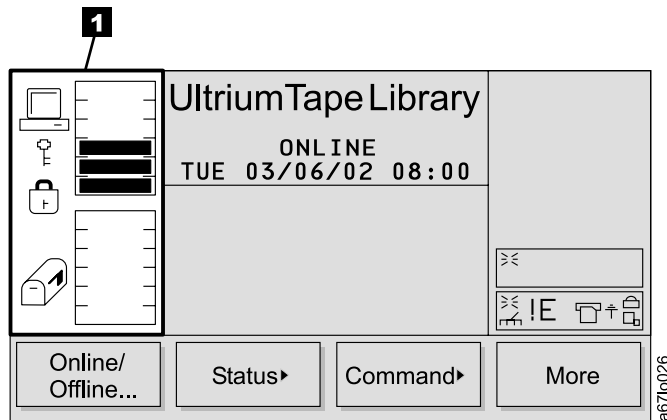
Figure 60. I/O station status area

Library Status Area

The library status area displays the current action, activity, or state of the library (see **1** in Figure 61).
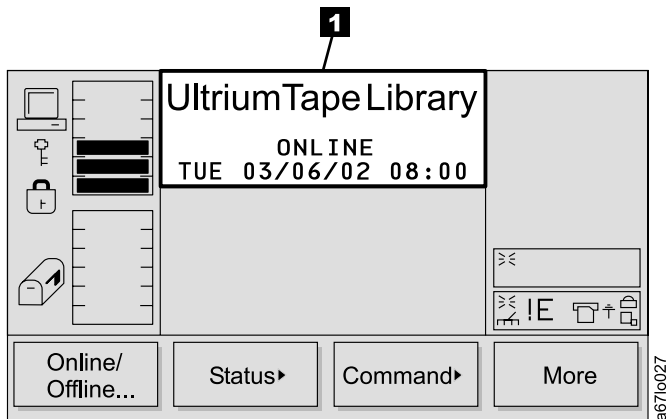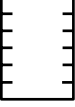
Figure 61. Library Status Area

Table 11. Icons in the I/O station status area

Icon	Description
	This icon is displayed on screen if the server has issued a **PREVENT/ALLOW MEDIUM REMOVAL** SCSI command and locked the I/O station.
	This icon is displayed on screen if the I/O station is locked. The I/O station can be locked by the following conditions: • The server issues a **PREVENT/ALLOW MEDIUM REMOVAL** SCSI command and locks the I/O station. • The library is in the process of accessing an I/O station slot. • The I/O station has been configured as all storage slots (rather than all I/O slots). This icon is displayed if the I/O station is unlocked.
	These icons are displayed on screen for the six I/O station states. **State 1:** The I/O station door is closed. Any cartridge in the I/O station has previously been inventoried. **State 2:** The I/O station door is partially open. Any cartridge in the I/O station has previously been inventoried. **State 3** The I/O station door is fully open. Any cartridge in the I/O station has previously been inventoried. For an import operation, a cartridge can be inserted. **State 4:** The I/O station door is closed. A cartridge has been exported and not yet removed. **State 5:** The I/O station door is partially open. A cartridge has been exported and not yet removed. **State 6:** The I/O station door is fully open. A cartridge has been exported and not yet removed. While in this state, an exported cartridge can be removed.
	These icons display on screen to show the possible configurations of the I/O station. **Type 1:** Displays when a single-slot I/O station is installed in the library. **Type 2:** Displays when a 12-slot I/O station is installed in the library. Cartridges are indicated by black slots. A total of 12 slots are available. **Type 3:** This icon displays when a 12-slot I/O station is installed in the library and is configured as storage. A total of 12 slots are available.

Drive Status Area

The drive status area continually provides information about the drives (see **1** in Figure 62). Table 12 on page 83 describes the icons in the drive status area.
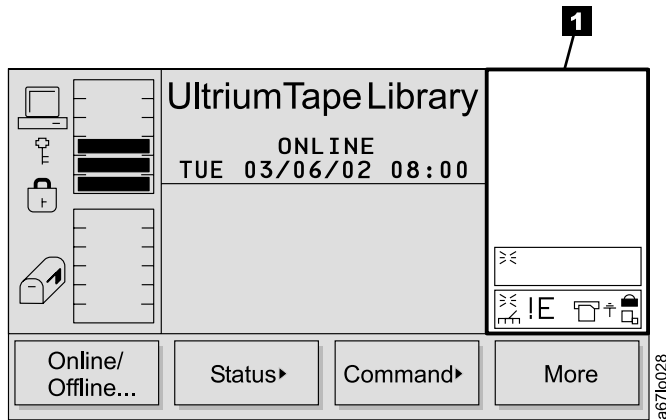
Figure 62. Drive status area

Message Area

The message area displays six lines of text, graphic representations, or a combination of both (see **1** in Figure 63). Each text line can be up to 20 characters long. The lines communicate interactive dialogs, special messages, alerts, library configurations, and error codes. For more information about the error codes that display, see Appendix D, "Error Messages", on page 297.
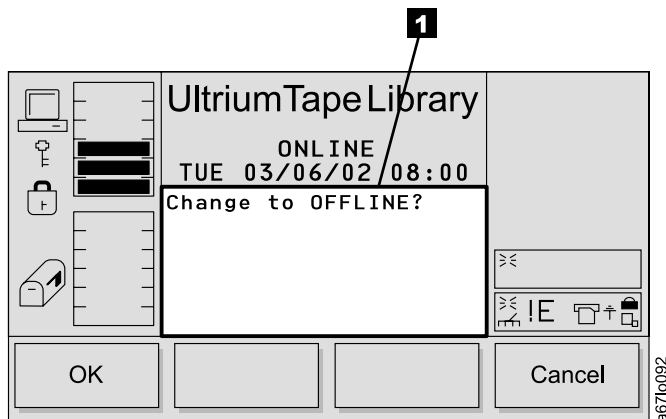
Figure 63. Message area

Table 12. Icons in the drive status area

Status	Icon	Description
Drive Present	⬜	A tape drive is present but does not contain a cartridge.
Power On	⪫⪪	If power is applied to the tape drive, the Power On icon displays.
Cleaning Required	🖌	If the tape drive needs cleaning, the Cleaning Required icon displays.
Error Code	! n	If a drive error occurs, an error code displays. See "Drive Error Codes" on page 310 for a list of drive error codes. n represents the character that displays.
Compression On	⬛	If the tape drive is compressing data on tape, the Compression On icon displays.
Write Protect	🔒	If the tape cartridge is write protected, the Write Protect icon displays.
Tape Activity	⬔↑	A tape drive is loading a cartridge.
	⬜	A tape drive has a cartridge loaded.
	↓⬜	A tape drive is rewinding a cartridge.
	↓⬔	A tape drive is unloading a cartridge.
	⬔	A tape drive has unloaded a cartridge.
	⬜→	A tape drive is reading data from a cartridge.
	→⬜	A tape drive is writing data to a cartridge.
	←⬜	A tape drive is erasing data from a cartridge.
	⬜↑	A tape drive is locating data on a cartridge.

RMU with TotalStorage Specialist

The Remote Management Unit (RMU) provides remote access to the Ultrium Scalable Tape Library over a network. You can attach the library to the network through a 10/100 Ethernet port on the RMU. Any server on the network can access the library if it has a web browser installed. All available functions are accessible without the need of a dedicated server or separate software. With the RMU and the TotalStorage Specialist software application you can access many of the functions that are described in Chapter 4, "Operating Procedures", on page 91.

The operator panel page of the TotalStorage Specialist web interface is protected by a password and is a direct interface to the operator panel of the attached library. It allows you to monitor the activity of the library. Any action that you perform (for example, pressing a button) is shown both on the web page and on the attached library.

TotalStorage Specialist Menu Description

The TotalStorage Specialist Home page is divided into three areas, the left navigation frame **1** , the center navigation frame **2** , and the top information frame **3** (see Figure 64).

Figure 64. TotalStorage Specialist home page

Left Navigation Frame

The left navigation frame (**1** in Figure 64) contains hyperlinks that are described in the following list:

Logout	Logs out the current user and returns to the Status page.
Contents	Opens a page that displays a brief description of the tabs for Status, Configuration, Firmware, Diagnostic files, Operator panel, and Logs.
Documentation	Opens a page that contains links to the library's online documentation.

SNMP MIB	Opens a page that displays an explanation of the Simple Network Management Protocol (SNMP) management information base (MIB). This page also contains an option to download the SNMP MIB.
Support	Opens a page that displays contact information for technical support.
Version	Opens a page that displays the current version of the RMU's firmware.
www.ibm.com	Opens the Home page for the IBM web site.

Center Navigation Frame

The center navigation frame (**2** in Figure 64 on page 84) has the following tab-style hyperlinks:
- Status
- Configuration
- Firmware
- Diagnostics file
- Operator panel
- Logs

If you select a tab other than the Status tab, a login page displays (see Figure 65). The initial login name is `admin` and the initial password is `secure`.

Note: A regular user cannot log into the RMU while an existing admin user is logged into the RMU. Only one regular user can be logged into the RMU at a time.

Figure 65. Login Page

The following sections describe each tab-style hyperlink.

Status

The Status page displays the current status of the library. From this page you can easily see if there are problems with the system (see Figure 66).

Figure 66. Status page

The Status page is not protected by a password and is active even when you are not logged into the RMU. If you select any tab other than the Status tab, a login page displays (see Figure 67). The initial login name is `admin` and the initial password is `secure`.

Note: A regular user cannot log into the RMU while an existing admin user is logged into the RMU. Only one regular user can be logged into the RMU at a time.

Figure 67. Login Page

Configuration

The Configuration page is protected by a password and allows you to configure the remote management unit. Network configuration (including SNMP), user configuration (adding users, setting passwords), and date and time setup are all entered on this page (see Figure 68). The initial RMU network configuration is done through the library operator panel during library installation and setup (see "Step 7. Configuring the RMU" on page 70).

Figure 68. Configuration page

Firmware

The Firmware page (see Figure 69) is protected by a password and allows you to update the firmware of the attached library, the RMU, or the drives in the library. For instructions about updating firmware, see "Updating All Firmware by Using the RMU" on page 237.
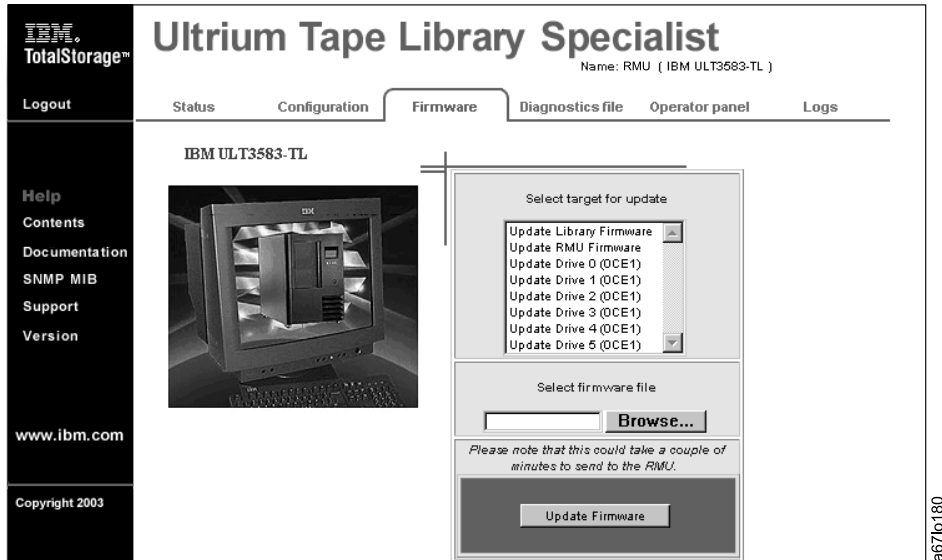
Figure 69. Firmware page

Diagnostics File

The Diagnostics file page is protected by a password and allows you to upload (to a local computer) the diagnostic information from the attached library. The diagnostic information may be useful to service personnel in diagnosing problems. Information from the library (command and error logs) and information from the RMU (error log) can be retrieved in text form. The system snapshot is a machine-decodable file which can only be used by service personnel (see Figure 70).

Figure 70. Diagnostics file page

Operator Panel

The Operator panel page is protected by a password and is a direct interface to the operator panel of the attached library. It allows you to monitor the activity of the library. Any action that you perform (for example, pressing a button) is shown both on this page and on the attached library (see Figure 71).

Figure 71. Operator panel page

Logs

The Logs page is protected by a password and shows the last few entries of the library command log (see Figure 72). To view the entire log, download it from the Diagnostics file page (see Figure 70 on page 88).

Figure 72. Logs page

Top Information Frame

The top information frame (**3** in Figure 64 on page 84) contains information for you to identify the tape library that you are remotely managing. The frame shows the URL identifier and library type. The URL identifier is the hostname given to the library during initial configuration. The library type is the ID string of the library and is taken from standard inquiry data.

Chapter 4. Operating Procedures

This chapter provides a summary of library operations, such as starting up, shutting down, handling media, updating firmware, and cleaning drives. Use the following table to quickly locate operating procedures. The procedures listed below are available from the library's operator panel. Because the TotalStorage Specialist web interface on the Remote Management Unit (RMU) has an operator panel tab selection, the same procedures are available remotely. The RMU, however, has additional tab selections, such as Firmware, Diagnostic file. These tab selections allow you to download library, drive and RMU firmware, and to upload library log information by using the web interface.

If You Want To Do This...	Go To Page...
Add or remove control paths	120
Calibrate the library	221
Choose the method of inventory	176
Clean a drive	144
Clear the drive's error log	124
Configure the I/O station as storage slots	178
Copy a drive dump	126
Create or erase an FMR tape	227
Disable security	185
Enable and disable backlighting and audio	174
Enable or disable automatic cleaning	144
Enable security	180
Exercise the library	214
Export a cartridge from the library	152
Force a drive dump	125
Import a cartridge into the library	137
Move a cartridge	127
Move the picker	130
Partition the physical library into a logical library	139
Perform a demonstration of the library	214
Perform an inventory of the library	133
Perform a self test of the library	218
Reset a tape drive	157
Resolve errors	189
Run drive diagnostics	223
Run library diagnostics	192
Select the online or offline state	95
Set up remote communication with the library	162
Unload a cartridge from a drive	155
Update drive, library, and RMU firmware	235
Upload library error log information by using the RMU	234

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Flowchart of Library Functions

*Applies to units with Multi-Path feature
**Applies to units without Multi-Path feature

Figure 73. Flowchart of library functions

Using the Main Menu

The Main Menu is the first interactive menu that displays after you turn on the power. The Main Menu consists of two screens: the initial screen and the alternate screen. You can select all subsequent menus and options from these two screens. Figure 74 shows the Main Menu's initial screen and Figure 75 shows the Main Menu's alternate screen.
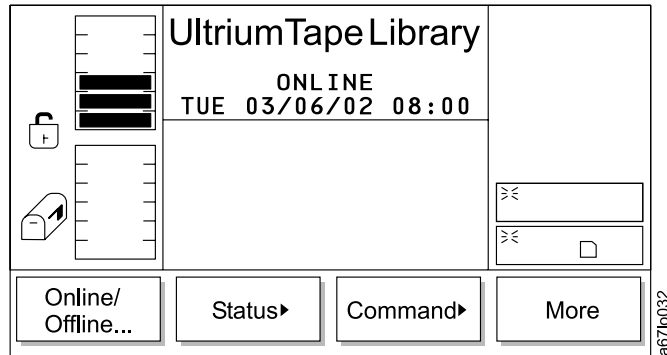
Figure 74. Main Menu (initial screen)

To display the Main Menu's alternate screen, press the button below the **More** softkey. The alternate screen displays (see Figure 75).
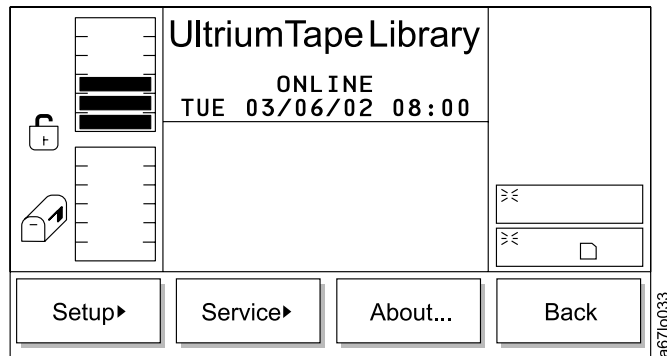
Figure 75. Main Menu (alternate screen)

To redisplay the Main Menu's initial screen, press the button below the **Back** softkey. To choose any of the selections, press the button below the desired softkey.

Selecting the Online or Offline State

Use the **Online/Offline** selection to change the operating state of the library after startup, before shutdown, or before diagnostic operations. To select **Online/Offline** from the Main Menu (initial screen), press the button below the **Online/Offline** softkey.

You can change the state of the library from Offline to Online or from Online to Offline. The sections that follow describe how to make the change.

Performing Functions That Require an Offline State

The functions listed under the **Command** and **Service** menus require that the library be in an offline state. If you attempt these functions while the library is online, the library prompts you to take it offline by presenting the following screen:
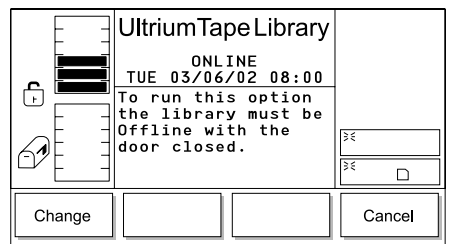
Figure 76. Change Dialog

Press the button below the **Change** softkey. The Offline Confirmation Dialog displays (see Figure 77).
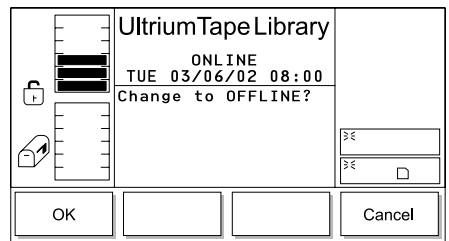
Figure 77. Offline Confirmation Dialog

Press the button below the **OK** softkey. The screen displays messages to indicate that the change is occurring, then the library goes offline.

Operator Intervention Message

If a problem causes an operator intervention message to appear, see Table 31 on page 305 for an explanation of the parameters in the message.

Operator Information Message

During the course of normal operation, operator information messages appear. See "Operator Information Messages" on page 309 for a list of the available messages.

Turning on the Power to the Tape Library

Perform the following to start the Ultrium Scalable Tape Library:

1. Securely latch the front door. The library does not require the door to be locked to operate properly. You can lock the front door for library security or to prevent the door from being opened accidentally.

> **CAUTION:**
> **Movements of mechanical components in the tape library can cause serious injury. Before turning the main power switch ON, confirm that no danger exists to personnel or property.**

2. Push | on the main power switch (**1** in Figure 78) to turn on the power.
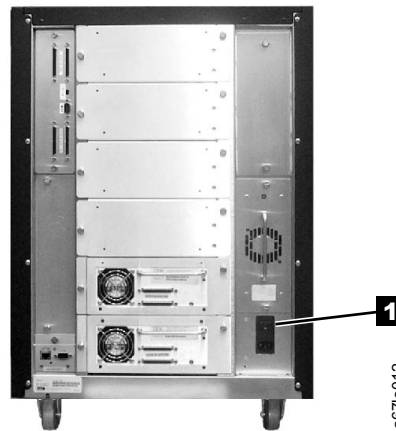
Figure 78. Main power switch

Power is applied to the tape library. The firmware starts the boot process with an introductory splash screen (see Figure 79).
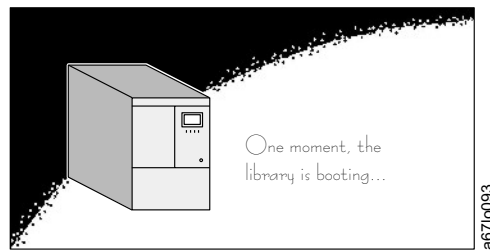
Figure 79. Splash screen

The firmware initiates a SELF-TEST, TEACH (auto-configuration), and SCANNING operation. After all of the firmware procedures are completed, the operator panel displays the Main Menu (initial screen) (see Figure 80 on page 97).

```
┌─────────────────────────────────────────────────┐
│  ┌──────┐  UltriumTapeLibrary    │               │
│  │      │                         │               │
│  │▬▬▬▬▬ │      ONLINE            │               │
│  │▬▬▬▬▬ │  TUE 03/06/02 08:00   │               │
│  🔓│      │                         │               │
│  │      │                         │  ┌─────────┐ │
│  🏷️ │      │                         │  │  ✂      │ │
│  │      │                         │  ├─────────┤ │
│  │      │                         │  │  ✂    ⬜ │ │
│  └──────┘                         │  └─────────┘ │
│ ┌────────┐┌────────┐┌──────────┐┌──────────┐    │
│ │Online/ ││Status▶ ││Command▶  ││  More    │    │
│ │Offline...││        ││          ││          │    │
│ └────────┘└────────┘└──────────┘└──────────┘    │
└─────────────────────────────────────────────────┘
```
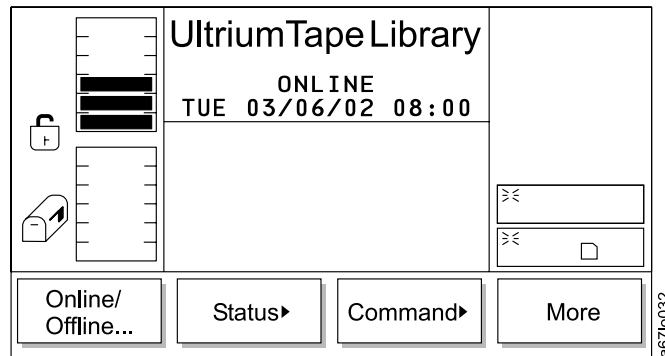
Figure 80. Main Menu (initial screen)

Shutting Down the Tape Library

You can shut down the Ultrium Scalable Tape Library normally or by the emergency shutdown method.

Attention: Except in emergencies, stop the library with the normal shutdown procedure before switching off the main power switch. IBM is not responsible for damage that is caused by improper use of the main power switch. All risk lies entirely with the user.

Performing a Normal Shutdown

To properly shut down the Ultrium Scalable Tape Library, perform the following steps:

1. Ensure that all cartridges are removed from the drives and are stored in the library's storage slots.
2. Push O on the main power switch (**1** in Figure 78 on page 96) to turn off the power. Power is removed from the tape library.

Performing an Emergency Shutdown

Attention: Perform the following in cases of emergency only.

Push O on the main power switch (**1** in Figure 78 on page 96) to turn off power. Power is removed from the tape library. All picker movements stop immediately.

Restarting the Tape Library

Perform the following to restart the Ultrium Scalable Tape Library:

1. If applicable, correct any conditions that required a shutdown of the tape library.
2. See "Turning on the Power to the Tape Library" on page 96 for instructions about powering-on the tape library.

Inserting Media

You can insert media into the Ultrium Scalable Tape Library by using the I/O station or by opening the front door (a method called *direct insertion*). Use direct insertion the first time that you insert media into the library. The sections that follow describe each method.

Inserting Media Through the I/O Station

Placement of new media into the library is best accomplished by using the I/O station. Using the I/O station to insert cartridges (import) does not disrupt library operations. To insert cartridges through the I/O station, perform the following procedure:

1. Open the door of the I/O station.

2. Insert the cartridge into an empty storage slot.

3. Close the door of the I/O station. The library locks the I/O station and executes the TEACH and INVENTORY procedures for column 1. It then unlocks the I/O station.

4. Move the cartridge to the desired storage slot by using one of the following methods:

   - Use the server's software application.

   - Issue the SCSI MOVE MEDIUM command from the server, with the source I/O station element address and the destination storage element address.

   - Refer to the procedure in "Importing a Cartridge into the Library" on page 137.

   - Refer to the procedure in "Moving a Cartridge" on page 127.

Inserting Media Directly into the Tape Library

Attention: Do not use this method to insert a cleaning cartridge into the library. To insert a cleaning cartridge, see "Enabling and Disabling Automatic Cleaning" on page 144.

To directly insert media, perform the following procedure:

1. Use the operator panel to place the library into the Offline state (**Main Menu —> Online/Offline —> OK**). The picker completes any current task.

2. Unlock and open the library door.

3. Place the cartridge into the desired storage slot.

4. Close and lock the door.

   The library executes the TEACH and INVENTORY procedures.

Removing Media

You can remove media from the Ultrium Scalable Tape Library by using the I/O station or by opening the front door (a method called *direct removal*). The sections that follow describe each method.

Removing Media Through the I/O Station

Use the I/O station to remove media from the library. Using the I/O station to remove cartridges (export) does not disrupt library operations. To remove cartridges through the I/O station, perform the following procedure:

1. Select the cartridges that you want to move to the I/O station by using one of the following methods:
   - Use the server's software application.
   - Issue a SCSI MOVE MEDIUM command from the server with the source storage element address and the destination I/O station element address.
   - Refer to the procedure in "Exporting a Cartridge from the Library" on page 152.
   - Refer to the procedure in "Moving a Cartridge" on page 127.
2. Open the door of the I/O station.
3. Remove the cartridge from the storage slot.
4. Close the door of the I/O station.

The library locks the I/O station and executes the TEACH and INVENTORY procedures for column 1. It then unlocks the I/O station.

Removing Media Directly from the Tape Library

Attention: Do not use this method to remove a cleaning cartridge from the library. To remove a cleaning cartridge, see "Enabling and Disabling Automatic Cleaning" on page 144.

To directly remove media, perform the following procedure:

1. Use the operator panel to place the library into the Offline state (**Main Menu —> Online/Offline —> OK**). The picker completes any current task.
2. Unlock and open the library door.
3. Remove the cartridge from the desired storage slot.
4. Close and lock the door.
   The library executes the TEACH and INVENTORY procedures.

Viewing Library Status and Usage

From the Web

The status page displays the current status of the library. From this page you can easily see if there are problems with the system (see Figure 81 on page 100).

The status page is not protected by a password and is active even when you are not logged into the RMU.
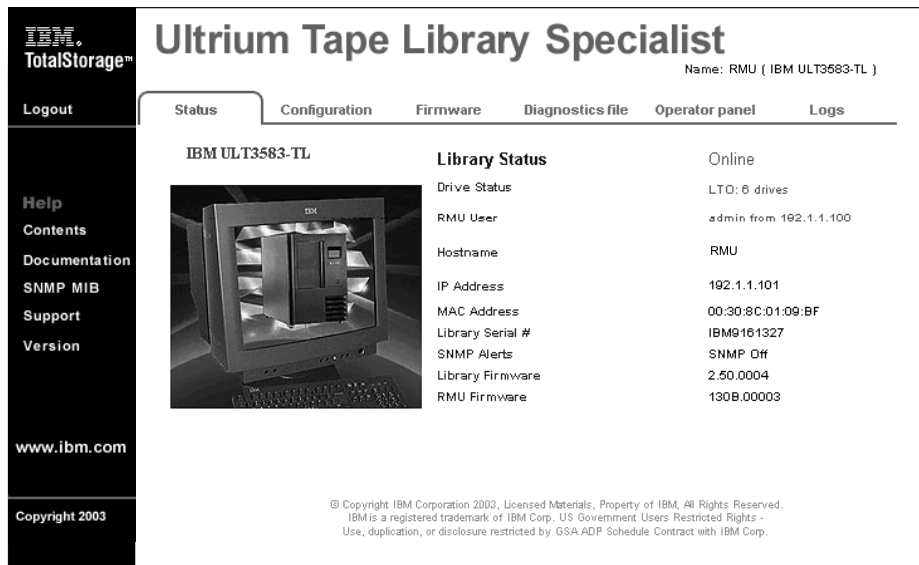
Figure 81. Status page

From the Operator Panel

To view the quantity of occupied and empty storage slots, I/O station slots, and drives in the library, perform the following steps. This procedure also allows you to determine usage statistics for the library.
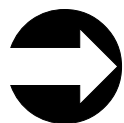
Shortcut: Main Menu (initial screen) —> Status —> Library —> System —> Next

Figure 82. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 83 on page 101).

Figure 83. Status Menu

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 84).

Figure 84. Library Submenu

3. Press the button below the **System** softkey. The System Dialog displays (see Figure 85). The screen gives the quantity of full (occupied) and empty storage slots, I/O station slots, and drives.
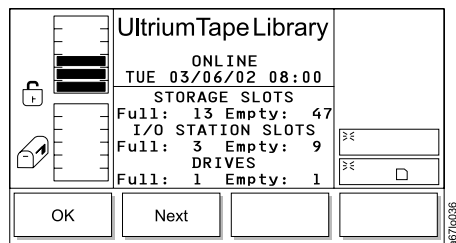
Figure 85. System Dialog

4. To view usage statistics for the library, press the button below the **Next** softkey. The Statistics Dialog displays (see Figure 86 on page 102) with the following information:

Moves The lifetime number of slot-to-slot moves.

IO accessed The lifetime number of times that the door of the I/O station has opened.

Get retries The lifetime number of recovery tries on get operations.

Put retries The lifetime number of recovery tries on put operations.

Scan retries The lifetime number of recovery retries on scan operations.
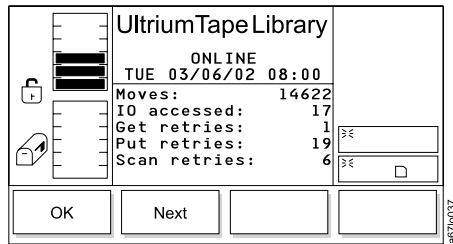
Figure 86. Statistics Dialog

5. To return to the System Dialog, press the button below the **Next** softkey. To return to the Library Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Viewing Drive Status

To view the quantity and location of occupied and empty drives in the library, refer to the icons on the operator panel (see "Drive Status Area" on page 82).

Viewing Information about a Drive

To view each drive's number (location in the drive column), type, serial number, version of firmware, and SCSI ID, perform the following steps.

Shortcut: Main Menu (initial screen) —> Status —> Drives —> Change Drive
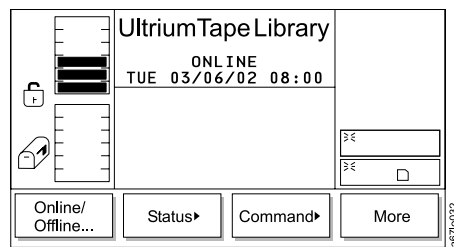
Figure 87. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 88).
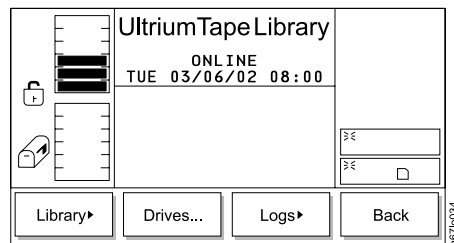
Figure 88. Status Menu

2. Press the button below the **Drives** softkey. The Drives Dialog displays (see Figure 89).
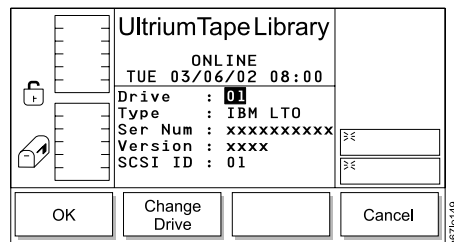
Figure 89. Drives Dialog

The Drives Dialog contains the following information about the currently selected drive:

Drive   The number of the drive. The number is based on the location of the drive in the drive column. The numbers range from 01 to 06, from bottom to top.

Type   The type of the drive (IBM LTO).

Ser Num   The serial number of the drive.

Version   The level of firmware installed in the drive.

SCSI ID   The SCSI ID of the drive.

3. To view the information about another drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays in the Drive field. The screen automatically refreshes with information about that drive.

4. To return to the Status Menu, press the button below the **OK** or **Cancel** softkey. To return to the Main Menu press the button below the **OK** or **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Viewing Storage Slot Status and Usage

To view the quantity of occupied and empty storage slots, perform the following steps. This procedure also allows you to determine usage statistics for each storage slot.

To view the locations of cartridges in the library, see "Viewing Information about a Storage Slot" on page 107.

Shortcut: **Main Menu (initial screen) —> Status —> Library —> System**
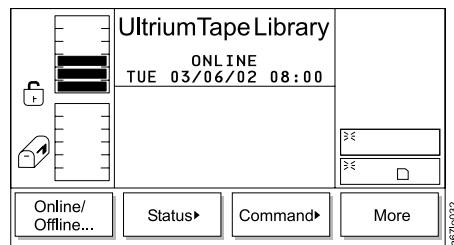
Figure 90. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 91).
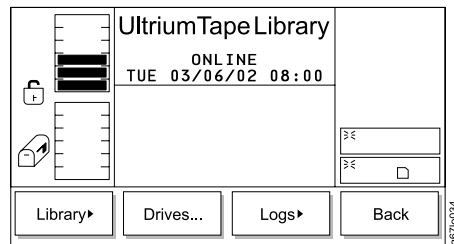
Figure 91. Status Menu

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 92).
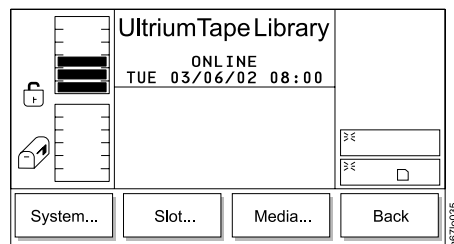
Figure 92. Library Submenu

3. Press the button below the **System** softkey. The System Dialog displays (see Figure 93). The screen gives the number of full (occupied) and empty storage slots. It also lists the number of full and empty I/O station slots and drives.
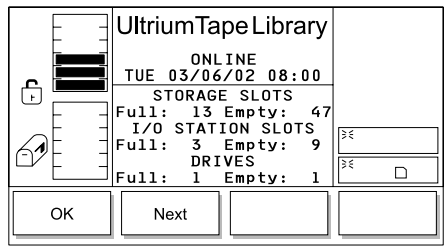
Figure 93. System Dialog

4. To return to the Library Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Viewing Information about a Storage Slot

For each storage slot, you can view its 3-character physical address, whether it is full, empty or unable to be occupied, and the bar code number and home position of the cartridge that occupies it. To view this information, perform the following steps.

Shortcut: <u>Main Menu</u> (initial screen) —> Status —> Library —> Slot
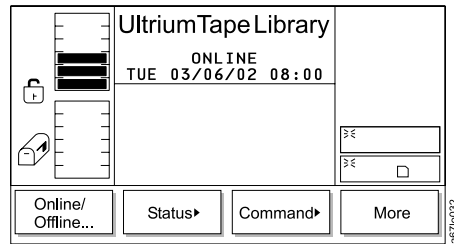
Figure 94. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 95).
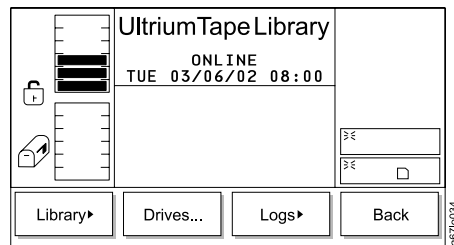
Figure 95. Status Menu

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 96).

Figure 96. Library Submenu

3. Press the button below the **Slot** softkey. The Slot Dialog displays (see Figure 97 on page 108) with a message area that shows three icons.
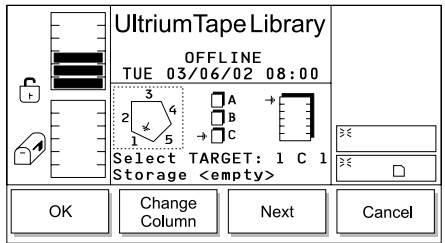
Figure 97. Slot Dialog

- The left icon represents the columns in the library, with an arrow pointed to the column that is currently selected.
- The middle icon represents the magazines in the currently selected column. The arrow points to the currently selected magazine.
- The right icon represents the storage slots in the currently selected column and magazine. The arrow points to the currently selected storage slot.

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 1, magazine C, and storage slot 1 indicate a physical address of 1 C 1. In the Slot Dialog, a slot's physical address displays below the right icon (see Figure 97).

4. Perform one of the following:
- To view information about the currently selected storage slot, press the button below the **OK** softkey. The Slot Status Dialog displays (see Figure 100 on page 109).
- To view information about another storage slot, specify its physical address by performing the following steps:

  a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 98).
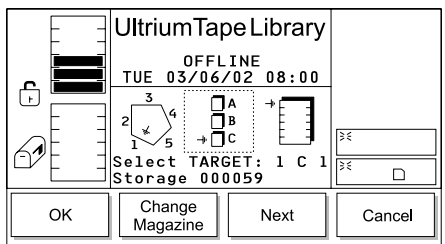
Figure 98. Change Magazine Dialog

> **Note:** If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the **Change Column** softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.

b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the button below the **Next** softkey. The Change Slot Dialog displays (see Figure 99).
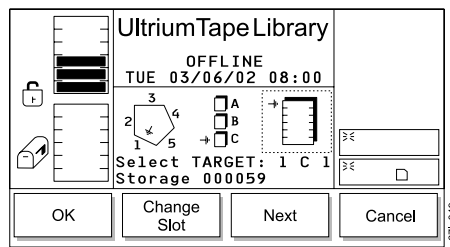
Figure 99. Change Slot Dialog

c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.

d. Perform one of the following:

   – To accept the physical address of storage slot (located below the right icon), press the button below the **OK** softkey.

   – To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The screen similar to the Slot Status Dialog displays (see Figure 100). The screen shows the new 3-character address that you specified.
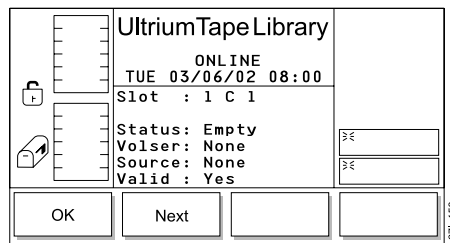
Figure 100. Slot Status Dialog. If you specified another slot, the new address displays in the Slot field.

The Slot Status Dialog contains the following information about the currently selected storage slot:

Slot   The three-position physical address of the storage slot. Represented as x y z, where x equals the number of the column, y equals the number of the magazine, and z equals the number of the storage slot.

Status   Indication of whether the cartridge is present (Full) or not present (Empty).

Volser   Bar code number of the cartridge in the storage slot (the bar code number is also called the volume serial number). If no cartridge is present in the slot, the value of this field is None.

Source   Element address of the cartridge in the storage slot (see Appendix B, "Element Addressing", on page 285). If no cartridge is present, the value of this field is None.

Valid   Indication of whether the slot can (Yes) or cannot (No) be used.

To return to the Slot Dialog (see Figure 97 on page 108), press the button below the **OK** softkey.

5. To view information about put and get operations for the slot, press the button below the **Next** softkey. The Put/Get Information screen displays (see Figure 101).
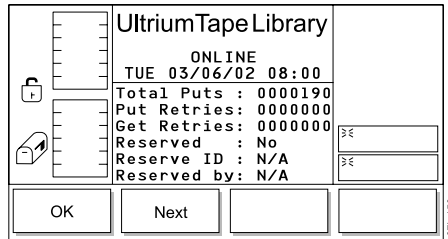
Figure 101. Put/Get Information

The Put/Get Information screen contains the following information about the currently selected storage slot:

Total Puts   Total put operations.

Put Retries   Number of put retry operations.

Get Retries   Number of get retry operations.

Reserved   Indication of whether the slot is reserved (Yes) or not reserved (No) by a SCSI host.

Reserve ID   The identifier for the slot reservation that was made by the SCSI host.

Reserved by   The identifier of the host that reserved the slot.

To return to the Slot Dialog (see Figure 97 on page 108), press the button below the **OK** softkey.

6. To view the coordinates that the X-, Y-, and Z-axes use to move cartridges to and from the selected slot, press the button below the **Next** softkey. The Position Dialog displays (see Figure 102).
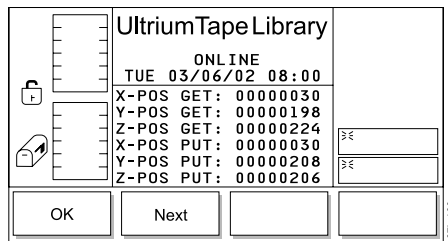
Figure 102. Position Dialog

The Position Dialog contains the following information about the currently selected storage slot:

X-POS GET   Rotary coordinate that the picker uses to retrieve a cartridge from the selected slot.

Y-POS GET   Vertical coordinate that the picker uses to retrieve a cartridge from the selected slot.

Z-POS GET   Horizontal coordinate that the picker uses to retrieve a cartridge from the selected slot.

X-POS PUT   Rotary coordinate that the picker uses to insert a cartridge into the selected slot.

Y-POS PUT   Vertical coordinate that the picker uses to insert a cartridge into the selected slot.

Z-POS PUT   Horizontal coordinate that the picker uses to insert a cartridge into the selected slot.

7. To return to the Slot Status Dialog (see Figure 100 on page 109), press the button below the **Next** softkey. To return to the Slot Dialog (see Figure 97 on page 108), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Viewing Cartridge Locations

To view the volume serial number (VOLSER), column, section, row, and cell number of a selected tape cartridge, perform the following steps:

Shortcut: Main Menu (initial screen) —> Status —> Library —> Media
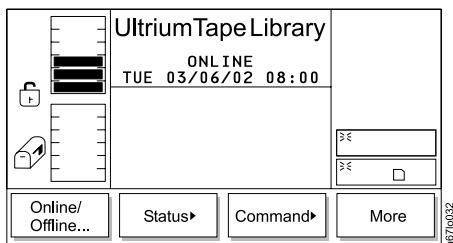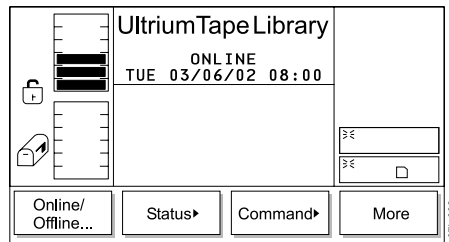

Figure 103. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 104).
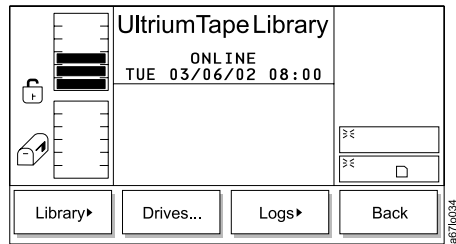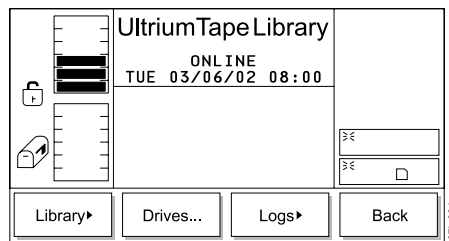

Figure 104. Status Menu

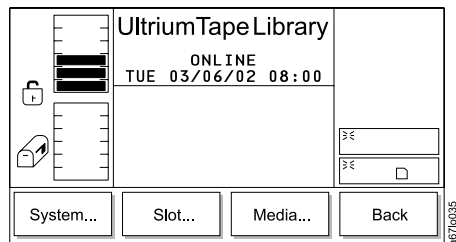2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 105).
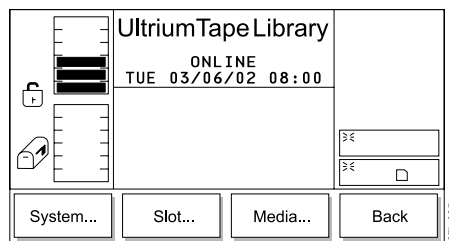
Figure 105. Library Submenu

3. Press the button below the **Media** softkey. The Media Dialog displays a list of tape cartridges in the library by their VOLSERs and their locations (see Figure 106 on page 113). The location is a 3-character physical address (x y z) where x equals the number of the column, y equals the number of the magazine, and z equals the number of the storage slot.
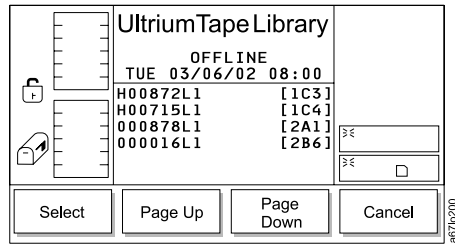
Figure 106. Media Dialog

4. Press the button below the **Page Up** or **Page Down** softkey to locate the cartridge that you want, then press the button below the **Select** softkey. The Select Media Dialog displays with a selection bar that lets you choose a cartridge (see Figure 107).
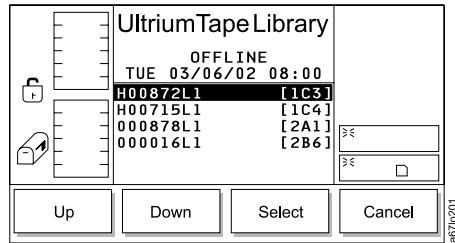
Figure 107. Select Media Dialog

5. Press the button below the **Up** or **Down** softkey to move the selection bar and highlight the cartridge that you want, then press the button below the **Select** softkey. The Media Information Dialog displays (see Figure 108).
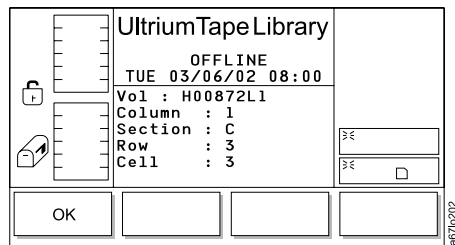
Figure 108. Media Information Dialog

The Media Information Dialog contains the following information about the selected tape cartridge:

Volser   Bar code number.

Column   Number of the column that contains the cartridge.

Section   Letter of magazine that contains the cartridge.

Row   Number of storage slot that contains the cartridge.

Cell   The location of a storage slot in the library, as counted continuously from the top slot in the I/O station to the bottom of the last column in the library.

6. To return to the Media Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Viewing the Command Log

From the Web

The logs page is protected by a password and shows the most recent entries in the library command log (see Figure 109). To view the entire log, download it from the diagnostics file page (see Figure 70 on page 88).

Figure 109. Diagnostics file page

From the Operator Panel

Use the Command Log to view a log of library operations and to dump the log to the serial port for printing. The Command Log displays the most recent entry and keeps a maximum of 50 entries.

For HyperTerminal connections and settings, see the section about retrieving command and error logs in the *IBM 3583 Ultrium Scalable Tape Library Maintenance Information* manual.

Shortcut: Main Menu (initial screen) —> Status —> Logs —> Command Log
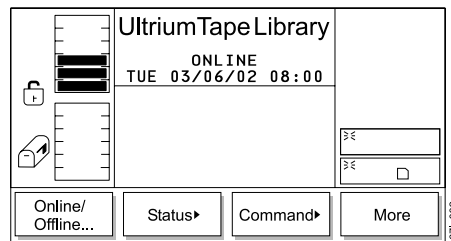
Figure 110. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 111).



```
 ┌──────────────────────────────────────────────────┐
 │      ┌─────┐  UltriumTapeLibrary                  │
 │      │▓▓▓▓▓│        ONLINE                         │
 │      │▓▓▓▓▓│    TUE 03/06/02 08:00                 │
 │   🔓 │     │                                       │
 │   ┌┐ │     │                               ┌─────┐ │
 │   │╱ │     │                               │ ✂   │ │
 │      └─────┘                               │ ✂ ▢ │ │
 │ ┌────────┬────────┬────────┬────────┐     └─────┘ │
 │ │Library▶│Drives..│Logs▶   │ Back   │             │
 │ └────────┴────────┴────────┴────────┘             │
 └──────────────────────────────────────────────────┘
```
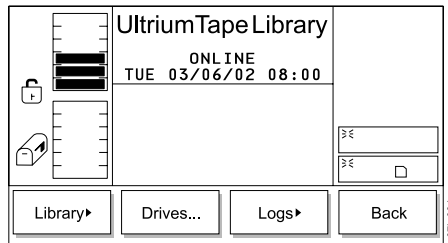
Figure 111. Status Menu

2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 112).


```
 ┌──────────────────────────────────────────────────┐
 │      ┌─────┐  UltriumTapeLibrary                  │
 │      │▓▓▓▓▓│        ONLINE                         │
 │      │▓▓▓▓▓│    TUE 03/06/02 08:00                 │
 │   🔓 │     │                                       │
 │   ┌┐ │     │                               ┌─────┐ │
 │   │╱ │     │                               │ ✂   │ │
 │      └─────┘                               │ ✂ ▢ │ │
 │ ┌────────┬────────┬────────┬────────┐     └─────┘ │
 │ │Command │ Error  │ Drive  │ Back   │             │
 │ │Log...  │ Log... │ Log... │        │             │
 │ └────────┴────────┴────────┴────────┘             │
 └──────────────────────────────────────────────────┘
```
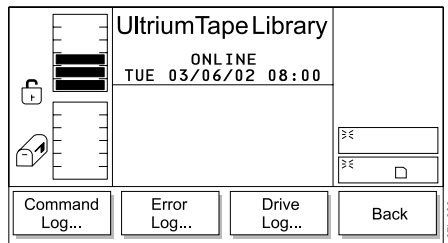
Figure 112. Logs Submenu

3. Press the button below the **Command Log** softkey. The Command Log Dialog displays the date and time of the most recent library operation and any message text (see Figure 113). The screen presents one operation at a time. For each operation, the date is shown as `mm/dd/yy`, where `mm` equals the month, `dd` equals the day, and `yy` equals the year. The time is shown as `hh:mm:ss`, where `hh` equals the hour, `mm` equals the minute, and `ss` equals the second. The message text is useful to Engineering only.
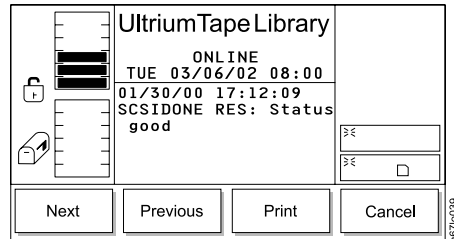
Figure 113. Command Log Dialog

4. Press the button below the **Previous** or **Next** softkey to view the date and time of the previous or next command operation in the log.
5. Perform one of the following:
   • To return to the Logs Submenu, press the button below the **Cancel** softkey.
   • To print the command log, press the button below the **Print** softkey. The Print Dialog displays (see Figure 114). Press the button below the **OK** softkey to send the log to your printer. After the operation is complete, the screen refreshes. To return to the Logs Submenu, press the button below the **Cancel** softkey.
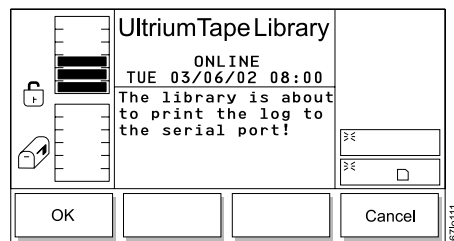
Figure 114. Print Dialog

6. To return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Viewing the Library's Error Log

Use the Error Log to view a log of the library's errors and to dump the log to the serial port for printing. The Error Log displays the most recent entry and keeps a maximum of 213 entries.

Note: The error code that displays in the Error Log Dialog is for Engineering use only; it is not the Service Action Code (SAC).

Shortcut: **Main Menu (initial screen) —> Status —> Logs —> Error Log**

Figure 115. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 116).
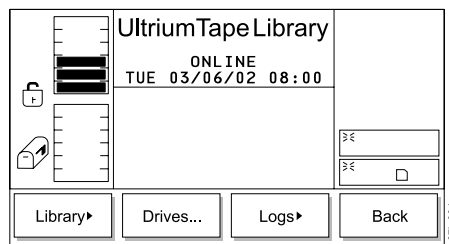
Figure 116. Status Menu

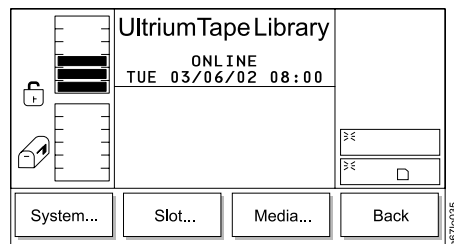2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 117).
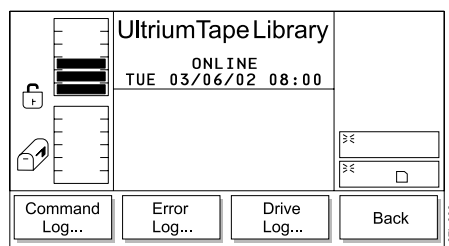
Figure 117. Logs Submenu

3. Press the button below the **Error Log** softkey. The Error Log Dialog displays (see Figure 118 on page 119).
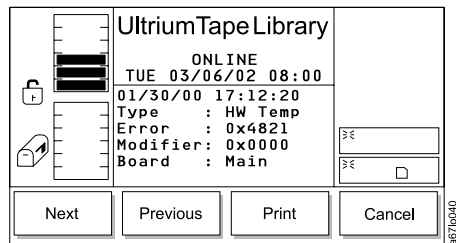
Figure 118. Error Log Dialog

The Error Log Dialog contains the following information about the most recent library error:

Date
: The date that the error occurred (shown as `mm`/`dd`/`yy`, where `mm` equals the month, `dd` equals the day, and `yy` equals the year).

Time
: The time that the error occurred (the time is shown as `hh`:`mm`:`ss`, where `hh` equals the hour, `mm` equals the minute, and `ss` equals the second).

Type
: The type of error that occurred. This message text is useful to Engineering only.

Error
: A hexadecimal number that is useful to Engineering only.

Modifier
: A hexadecimal number that is useful to Engineering only.

Board
: The printed circuit board adapter (PCBA) that is associated with the error. Valid values are any PCBA.

4. Press the button below the **Previous** or **Next** softkey to view the date and time of the previous or next error in the log. The screen presents one error at a time.

5. Perform one of the following:

   - To return to the Logs Submenu, press the button below the **Cancel** softkey.

   - To print the error log, press the button below the **Print** softkey. The Print Dialog displays (see Figure 119). Press the button below the **OK** softkey to send the log to your printer. After the operation is complete, the screen refreshes. To return to the Logs Submenu, press the button below the **Cancel** softkey.
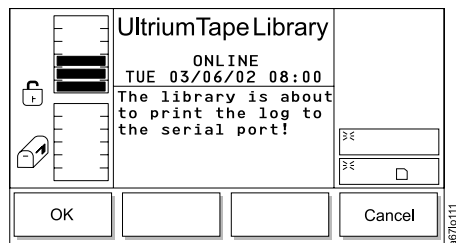
Figure 119. Print Dialog

6. To return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Adding or Removing Control Paths

Before adding or removing control paths, you must activate the feature license. The maximum allowable control paths for a library is equal to the quantity of drives assigned to that library.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Drives —> Loop/SCSI
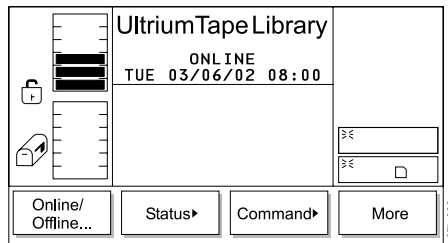
Figure 120. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 121).
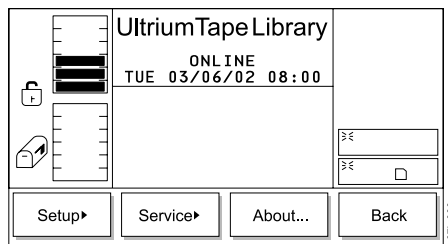
Figure 121. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 122).
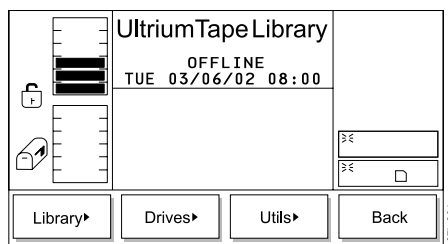
Figure 122. Setup Menu

3. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 123).
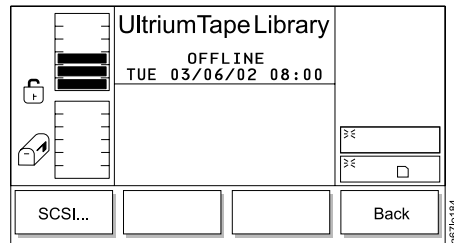
Figure 123. Drives Submenu

4. Press the button below the **Loop/SCSI** softkey. The Loop/SCSI submenu displays (see Figure 124). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the `Drive:` field. The `Control path` field indicates whether the drive is a control path. Valid values are `OFF` or `ON`.

Figure 124. Loop/SCSI Submenu

5. Perform one of the following:
   - To accept the current values in the screen, press the button below the **OK** softkey.
   - To change the value of the drive, press the button below the **Change Drive** softkey until the drive that you want displays in the `Drive` field.
   - To change the status of the drive as a control path, press the button below the **Next** softkey until `ON` (to add) or `OFF` (to remove) displays in the `Control path:` field.
6. To return to the Drives Submenu (see Figure 123), press the button below the **Cancel** softkey. To return to the Main Menu, press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Viewing the Drive's Error Log

A maximum of 10 drive errors are available for viewing. To view a log of the drive's error, perform the following steps:

Shortcut: Main Menu (initial screen) —> Status —> Logs —> Drive Log
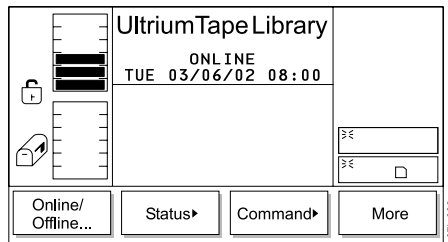
Figure 125. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 126).
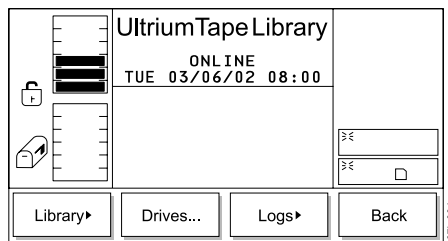
Figure 126. Status Menu

2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 127).
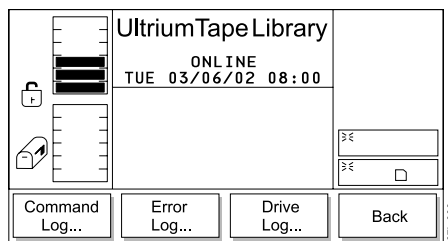
Figure 127. Logs Submenu

3. Press the button below the **Drive Log** softkey. The Select Drive Dialog displays (see Figure 128 on page 123).
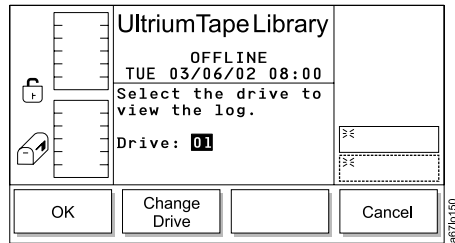
Figure 128. Select Drive Dialog

4. Perform one of the following:
   - To accept the number of the currently displayed drive, press the button below the **OK** softkey.
   - To change the number of the drive, press the button below the **Change Drive** softkey until the number that you want displays. Then, press the button below the **OK** softkey. Valid values for the `Drive` field are 01 through 06.

   The Drive Log Dialog displays (see Figure 129).
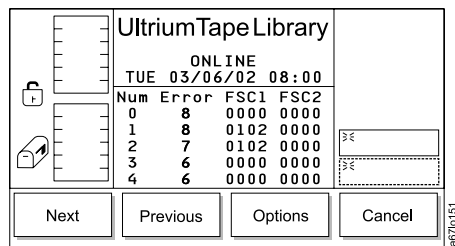
Figure 129. Drive Log Dialog

The Drive Log Dialog contains the following information about the most recent drive errors:

Num   The ID of the error.

Error   The type of error, as defined in "Drive Error Codes" on page 310.

FSC1   Fault symptom code 1. This information is useful to Engineering only.

FSC2   Fault symptom code 2. This information is useful to Engineering only.

5. Press the button below the **Previous** or **Next** softkey to view information about previous or additional drive errors in the log.

6. To return to the Logs Submenu (see Figure 127 on page 122), press the button below the **Cancel** softkey. To return to the Main Menu, press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Clearing the Drive's Error Log

To erase (clear) the current drive's error log, perform the following steps:
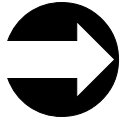
Shortcut: Main Menu (initial screen) —> Status —> Logs —> Drive Log —> OK (or **Change Drive) —> Options —> Clear Log**

1. Specify the drive that you want by performing steps 1 through 5 in "Viewing the Drive's Error Log" on page 122. The Drive Log Dialog displays (see Figure 130).

```
          Ultrium Tape Library
                ONLINE
          TUE 03/06/02 08:00
         Num Error FSC1 FSC2
          0    8    0000 0000
          1    8    0102 0000
          2    7    0102 0000      ><
          3    6    0000 0000
          4    6    0000 0000      ><

       Next    Previous   Options   Cancel
```

Figure 130. Drive Log Dialog

2. Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 131).

```
          Ultrium Tape Library
                OFFLINE
          TUE 03/06/02 08:00
         Num Error FSC1 FSC2
          0    8    0000 0000
          1    8    0102 0000
          2    7    0102 0000      ><
          3    6    0000 0000
          4    6    0000 0000      ><

      Clear    Force    Copy
      Log...   Dump...  Dump...    Back
```

Figure 131. Drive Error Log Options Submenu

3. Press the button below the **Clear Log** softkey. The library displays the message `This option will clear the current drive log contents`.
4. Press the button below the **OK** softkey. The drive clears its error log and displays the message `Requested command is now complete.`
5. To return to the Drive Error Logs Options Submenu (see Figure 131), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Back —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Forcing a Drive Dump

Attention: If the tape drive detects a permanent error and displays an error code, it automatically forces a drive dump (also known as a save of the firmware trace). If you force a drive dump, the existing dump will be overwritten and data will be lost. After you force a drive dump, do not turn off the power to the tape drive or you may lose the dump data.

To force a drive dump, perform the following steps.

<u>Shortcut:</u> **Main Menu (initial screen) —> Status —> Logs —> Drive Log —> OK** (or **Change Drive**) **—> Options —> Force Dump**

1. Specify the drive that you want by performing steps 1 through 5 in "Viewing the Drive's Error Log" on page 122. The Drive Log Dialog displays (see Figure 132).
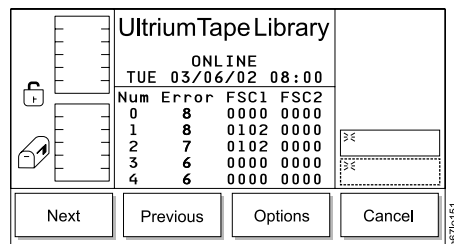
Figure 132. Drive Log Dialog

2. Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 133).
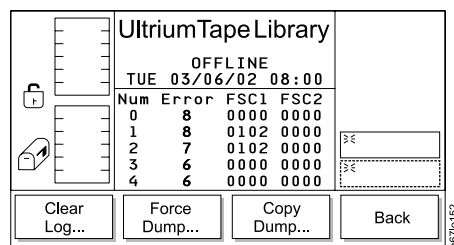
Figure 133. Drive Error Log Options Submenu

3. Press the button below the **Force Dump** softkey. The library displays the message `This option will force a drive dump`.
4. Press the button below the **OK** softkey. The drive forces the dump and displays the message `Requested command is now complete`. To obtain the dump, see "Copying a Drive Dump" on page 126.
5. To return to the Drive Error Logs Options Submenu (see Figure 133), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Back —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Copying a Drive Dump

Attention: Insert only a scratch data cartridge for this procedure. Data on the cartridge will be overwritten.

To copy a drive's error log to a tape cartridge, perform the following steps.

Shortcut: Main Menu (initial screen) —> Status —> Logs —> Drive Log —> OK or **Change Drive —> Options —> Copy Dump**

1. Specify the drive that you want by performing steps 1 through 5 in "Viewing the Drive's Error Log" on page 122. The Drive Log Dialog displays (see Figure 134).
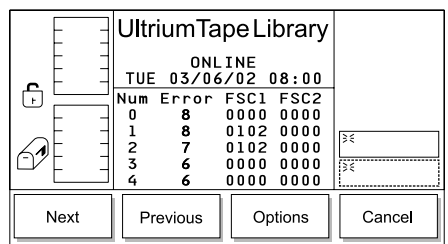
Figure 134. Drive Log Dialog

2. Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 135).
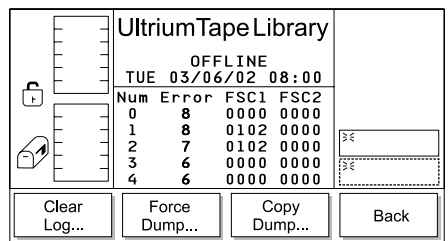
Figure 135. Drive Error Log Options Submenu

3. Press the button below the **Copy Dump** softkey. The Copy Dump Dialog prompts you to insert a scratch cartridge into the top I/O station slot.
4. After you insert the cartridge, press the button below the **OK** softkey. A message indicates that the command is in progress while the picker moves the cartridge from the I/O station to the drive. After the drive copies the dump to the tape, the picker returns the cartridge to the I/O station and displays the message `Requested command is now complete.`
5. To return to the Drive Error Log Options Submenu (see Figure 135), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Back —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Moving a Cartridge

To move a tape cartridge from a source location to a target location, perform the following steps.

Shortcut: **Main Menu (initial screen) —> Command —> Move —> Move Media**
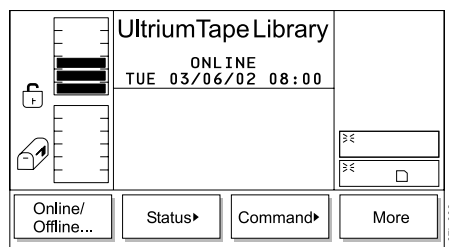

Figure 136. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 137).


Figure 137. Command Menu

2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 138).
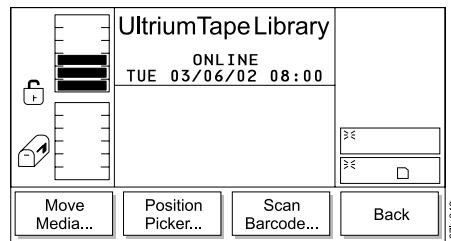

Figure 138. Move Submenu

3. Press the button below the **Move Media** softkey. The Source Move Media Dialog displays (see Figure 139 on page 128) with a message area that shows three icons:
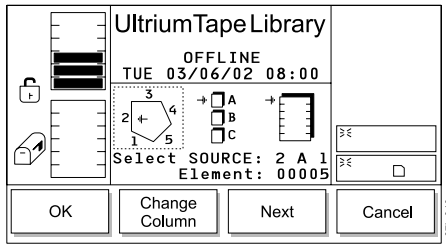
Figure 139. Source Move Media Dialog

- The left icon represents the columns in the library, with an arrow pointed to the column that is currently selected.
- The middle icon represents the magazines in the currently selected column. The arrow points to the currently selected magazine.
- The right icon represents the storage slots in the currently selected column and magazine. The arrow points to the currently selected storage slot.

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Source Move Media Dialog, a slot's physical address displays below the right icon (see Figure 139).

4. Specify the cartridge that you want to move by performing one of the following:

   - To move the cartridge from the physical address that is currently displayed, press the button below the **OK** softkey.
   - To move a cartridge from another location, specify its physical address by performing the following steps:

     a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 140).

        Note: If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the **Change Column** softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.
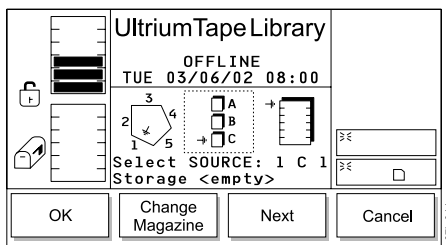
Figure 140. Change Magazine Dialog

     b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 141 on page 129).
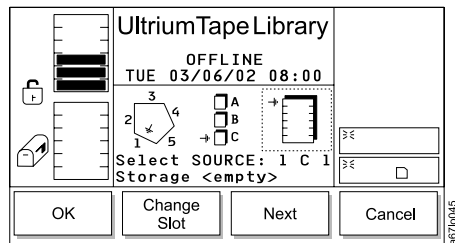
Figure 141. Change Slot Dialog

    c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.

    d. Perform one of the following:

       – To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.

       – To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The Target Move Media Dialog displays (see Figure 142).
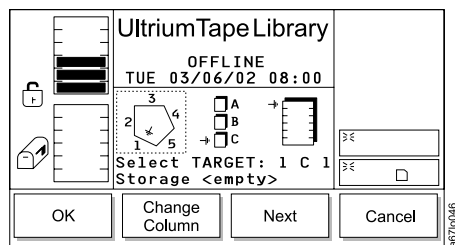
Figure 142. Target Move Media Dialog

5. Specify where you want the cartridge to be moved by repeating steps 4a through 4d. The library moves the cartridge from the source address to the target address and displays the message `Requested command is now complete.`

6. To return to the Move Submenu (see Figure 138 on page 127), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Moving the Picker

To move the picker in front of a specific element, perform the following steps.

Shortcut: Main Menu (initial screen) —> Command —> Move —> Position Picker
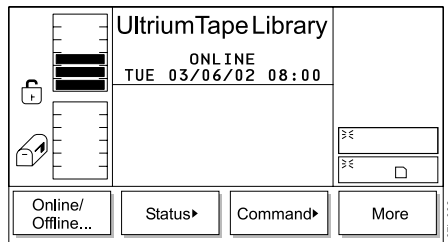
Figure 143. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 144).
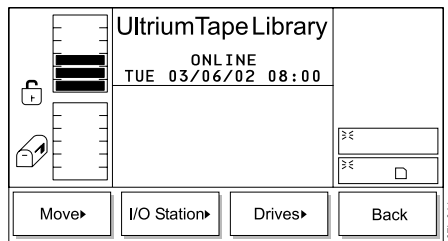
*Figure 144. Command Menu*

2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 145).
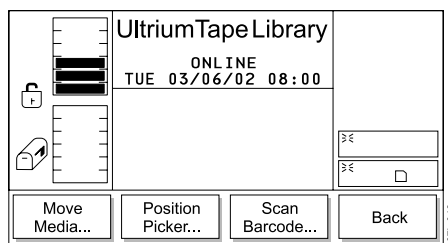
Figure 145. Move Submenu

3. Press the button below the **Position Picker** softkey. The Position Picker Dialog displays (see Figure 146 on page 131) with a message area that shows three icons:
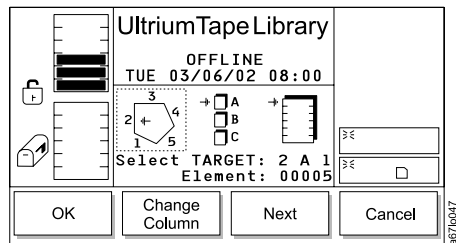
Figure 146. Position Picker Dialog

- The left icon represents the columns in the library, with an arrow pointed to the column that is currently selected.
- The middle icon represents the magazines in the currently selected column. The arrow points to the currently selected magazine.
- The right icon represents the storage slots in the currently selected column and magazine. The arrow points to the currently selected storage slot.

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Position Picker Dialog, a slot's physical address displays below the right icon (see Figure 146).

4. Specify where you want the library to move the picker by performing one of the following:

- To move the picker to the address that is currently displayed, press the button below the **OK** softkey.
- To move the picker to another location, specify the physical address by performing the following steps:

   a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 147).

      Note: If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the **Change Column** softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.
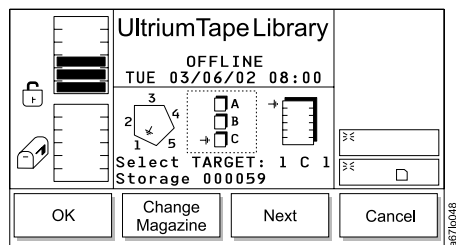
Figure 147. Change Magazine Dialog

b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 148).
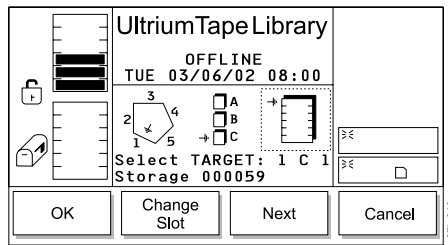
Figure 148. Change Slot Dialog

c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.

d. Perform one of the following:

– To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.

– To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The library moves the picker in front of the element that you specified and displays the message `Requested command is now complete.`

5. To return to the Move Submenu (see Figure 145 on page 130), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Performing an Inventory of the Library

To conduct an inventory on a specific quantity of storage slots, perform the following steps.

Note: To change how the library performs the inventory (by scanning labeled cartridges or touching unlabeled cartridges), see "Choosing the Method of Inventory" on page 176.

➡ **Shortcut: Main Menu (initial screen) —> Command —> Move —> Scan Barcode**
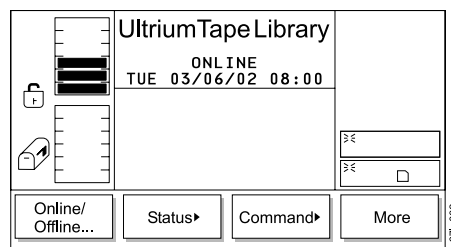
Figure 149. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 150).
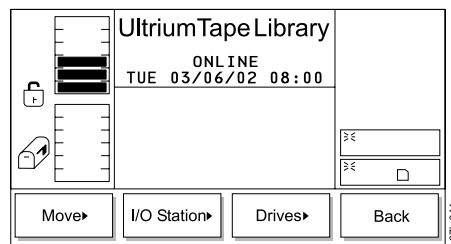
Figure 150. Command Menu

2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 151).
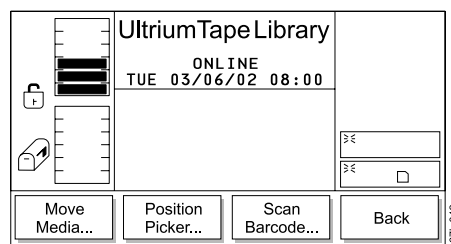
Figure 151. Move Submenu

3. Press the button below the **Scan Barcode** softkey. The Scan Barcode Dialog displays (see Figure 152) with a message area that shows three icons:
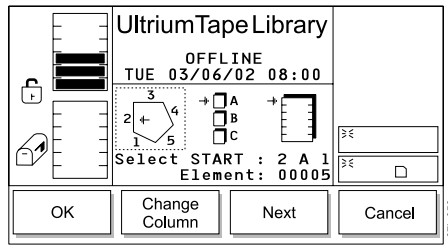
Figure 152. Scan Barcode Dialog

- The left icon represents the columns in the library, with an arrow pointed to the column that is currently selected.
- The middle icon represents the magazines in the currently selected column. The arrow points to the currently selected magazine.
- The right icon represents the storage slots in the currently selected column and magazine. The arrow points to the currently selected storage slot.

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Scan Barcode Dialog, a slot's physical address displays below the right icon (see Figure 152).

4. Specify the storage slot at which you want the inventory to begin by performing one of the following:

- To begin the inventory at the physical address that is currently displayed, press the button below the **OK** softkey.
- To begin the inventory at another location, specify the physical address by performing the following steps:

  a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 153 on page 135).

     Note: If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the **Change Column** softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.
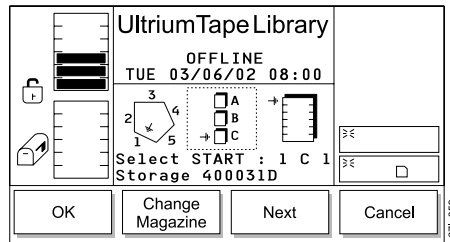
Figure 153. Change Magazine Dialog

b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the button below the **Next** softkey. The Change Slot Dialog displays (see Figure 154).
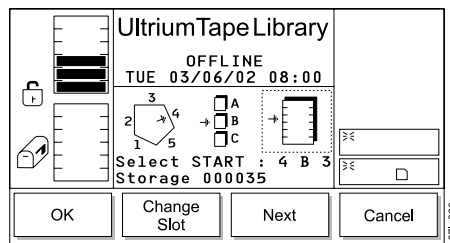
Figure 154. Change Slot Dialog

c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.

   – To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.

   – To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

   The Select Slots Dialog displays the quantity of slots to inventory (see Figure 155).
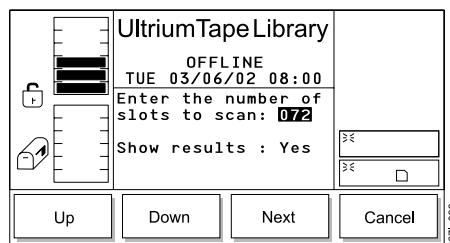
Figure 155. Select Slots Dialog

5. To specify the quantity of slots to inventory, press the button below the **Up** or **Down** softkey to increase or decrease the value in the field. The maximum number of slots that can be inventoried is 72. Press the button below the **Next** softkey. The Confirm Dialog displays (see Figure 156 on page 136).
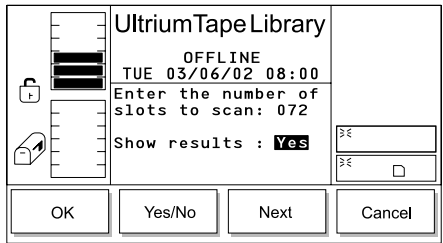
Figure 156. Confirm Dialog

6. To specify whether you want the results of the inventory to display on the operator panel, press the button below the **Yes/No** softkey until `Yes` or `No` displays in the `Show results` field.

7. To start the inventory, press the button below the **OK** softkey. The library begins the inventory at the physical address that you specified. After the inventory is done, one of the following occurs:

   - If you chose not to display the results, the library displays the message **Requested command is now complete.**

   - If you chose to display the results, the Completion Dialog displays (see Figure 157). The screen shows the quantity of cartridges that were found in the storage slots, I/O station, and drives.
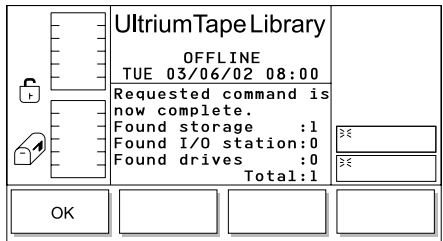
Figure 157. Completion Dialog

8. To return to the Move Submenu (see Figure 151 on page 133), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Importing a Cartridge into the Library

To move a tape cartridge from the I/O station to the first available slot, perform the following steps.

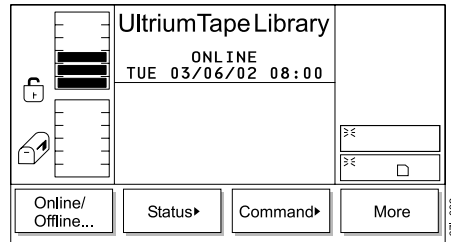**Shortcut:** **Main Menu (initial screen) —> Command —> I/O Station —> Import**
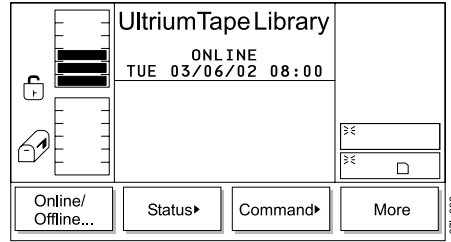
Figure 158. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 159).
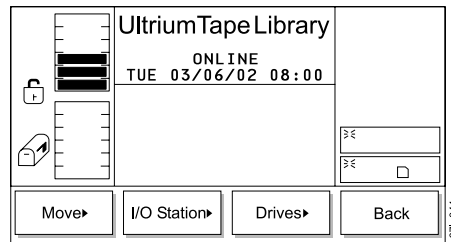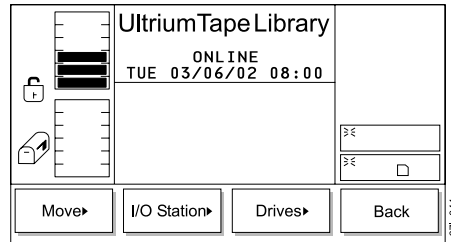

Figure 159. Command Menu

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 160).
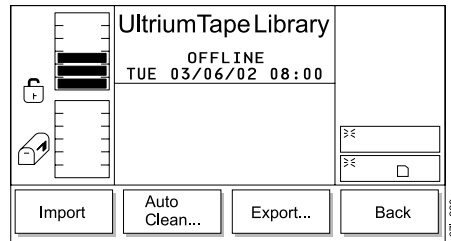
Figure 160. I/O Station Submenu

3. Press the button below the **Import** softkey. The picker moves the cartridge to the first available empty slot and the library displays the message `Requested command is now complete.`

4. To return to the I/O Station Submenu (see Figure 160 on page 137), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Partitioning the Library

You can partition the Ultrium Scalable Tape Library into a maximum of three logical libraries. If your application supports it, both Ultrium 1 and Ultrium 2 drives and media are allowed in the same logical library. Partitioning is possible only after you have installed drives that have the control path enabled.

Guidelines for Partitioning

Before partitioning your library into individual logical libraries, be aware of the the following rules.

Basic Guidelines
- Each logical library must contain at least one drive.
- The 6-slot fixed magazine on Column 1 is included as part of the first partition (Logical Library A).
- A logical library configuration of exactly one partition equals the entire physical library.
- The library prevents requests from the server to move media across the boundaries of logical libraries.

Guidelines for Partitioning Storage Cells
- Support for one logical library requires that at least Column 2 be installed.
- Support for two logical libraries requires that at least Columns 2 and 4 be installed.
- Support for three logical libraries requires that Columns 2, 4, and 5 be installed.
- If you install Column 5 and create only two logical libraries, Column 5 shall always be assigned to the second logical library (Logical Library B).
- Logical libraries have predetermined, fixed configurations. To view the configurations, refer to "Configurations for Logical Libraries" on page 140.

Guidelines for Partitioning Fixed Cells
Fixed cells (the dedicated slots for cleaning cartridges that are located at the top of each storage column) cannot be included in a logical library. The fixed cell cleaning cartridges are a resource of the physical library and are not affected by partitioning.

Guidelines for Partitioning Drives
- At least one control path must be enabled for each logical library.
- Each logical library has a predefined, unchangeable default control path as follows:
  - Logical Library A: Drive 1
  - Logical Library B: Drive 3
  - Logical Library C: Drive 5
- Each logical library must have a drive installed in its default control path drive position at the time of configuration.
- After the library has been partitioned into multiple logical libraries, any gap between installed default control path drives is not considered an error. For example, if the library is configured for two logical libraries with drives installed in positions 1 and 3 (but not in position 2), no error will be posted.
- Within a logical library, gaps between drives are considered errors.

Guidelines for Partitioning the I/O Station
The I/O station is a shared resource for all logical libraries.

Configurations for Logical Libraries

The tables in this section show the potential configurations for logical libraries. They include:

- One logical library with a 12-slot I/O station set to storage
- One logical library with a 12-slot I/O station set to I/O station
- Two logical libraries with a 12-slot I/O station set to I/O station
- Three logical libraries with a 12-slot I/O station set to I/O station
- One logical library with a 1-slot I/O station set to storage
- One logical library with a 1-slot I/O station set to I/O station
- Two logical libraries with a 1-slot I/O station set to I/O station
- Three logical libraries with a 1-slot I/O station set to I/O station

After you have selected the configuration that you want, go to "Performing the Partitioning Process" on page 143.

Configuration for One Logical Library with a 12-Slot I/O Station Set to Storage

Table 13. Configuration for one logical library with a 12-slot I/O station set to storage

	Column 1 Door	**Column 2 Storage 1**	**Column 3 Drives**	**[Column 4] Storage 2 See Note**	**[Column 5] Storage 3**
Magazine A	Logical library A	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine B	Logical library A	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine C	Logical library A	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for One Logical Library with a 12-Slot I/O Station Set to I/O Station

Table 14. Configuration for one logical library with a 12-slot I/O station set to I/O station

	Column 1 Door	**Column 2 Storage 1**	**Column 3 Drives**	**[Column 4] Storage 2 See Note**	**[Column 5] Storage 3**
Magazine A	I/O station	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine B	I/O station	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine C	Logical library A	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for Two Logical Libraries with a 12-Slot I/O Station Set to I/O Station

Table 15. Configuration for two logical libraries with a 12-slot I/O station set to I/O station

	Column 1 Door	**Column 2 Storage 1**	**Column 3 Drives**	**[Column 4] Storage 2 See Note**	**[Column 5] Storage 3**
Magazine A	Shared I/O station	Logical library A	[Logical library B]	Logical library B	[Logical library B]
			[Logical library B]		
Magazine B	Shared I/O station	Logical library A	[Logical library B]	Logical library B	[Logical library B]
			Logical library B		
Magazine C	Logical library A	Logical library A	[Logical library A]	Logical library B	[Logical library B]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for Three Logical Libraries with a 12-Slot I/O Station Set to I/O Station

Table 16. Configuration for three logical libraries with a 12-slot I/O station set to I/O station

	Column 1 Door	**Column 2 Storage 1**	**Column 3 Drives**	**[Column 4] Storage 2 See Note**	**[Column 5] Storage 3**
Magazine A	Shared I/O station	Logical library A	[Logical library C]	Logical library B	Logical library C
			Logical library C		
Magazine B	Shared I/O station	Logical library A	[Logical library B]	Logical library B	Logical library C
			Logical library B		
Magazine C	Logical library A	Logical library A	[Logical library A]	Logical library B	Logical library C
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for One Logical Library with a 1-Slot I/O Station Set to Storage

Table 17. Configuration for one logical library with a 1-slot I/O station set to storage

	Column 1 Door	**Column 2 Storage 1**	**Column 3 Drives**	**[Column 4] Storage 2 See Note**	**[Column 5] Storage 3**
Magazine A	Logical Library A	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine B		Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine C		Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for One Logical Library with a 1-Slot I/O Station Set to I/O Station

Table 18. Configuration for one logical library with a 1-slot I/O station set to I/O station

	Column 1 Door	Column 2 Storage 1	Column 3 Drives	[Column 4] Storage 2 See Note	[Column 5] Storage 3
Magazine A	I/O station	Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine B		Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			[Logical library A]		
Magazine C		Logical library A	[Logical library A]	[Logical library A]	[Logical library A]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for Two Logical Libraries with a 1-Slot I/O Station Set to I/O Station

Table 19. Configuration for two logical libraries with a 1-slot I/O station set to I/O station

	Column 1 Door	Column 2 Storage 1	Column 3 Drives	Column 4 Storage 2	[Column 5] Storage 3 See Note
Magazine A	Shared I/O station	Logical library A	[Logical library B]	Logical library B	[Logical library B]
			[Logical library B]		
Magazine B		Logical library A	[Logical library B]	Logical library B	[Logical library B]
			Logical library B		
Magazine C		Logical library A	[Logical library A]	Logical library B	[Logical library B]
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Configuration for Three Logical Libraries with a 1-Slot I/O Station Set to I/O Station

Table 20. Configuration for three logical libraries with a 1-slot I/O station set to I/O station

	Column 1 Door	Column 2 Storage 1	Column 3 Drives	Column 4 Storage 2	Column 5 Storage 3 See Note
Magazine A	Shared I/O station	Logical library A	[Logical library C]	Logical library B	Logical library C
			Logical library C		
Magazine B		Logical library A	[Logical library B]	Logical library B	Logical library C
			Logical library B		
Magazine C		Logical library A	[Logical library A]	Logical library B	Logical library C
			Logical library A		
Note: Items in brackets ([ ]) indicate an optional installation configuration.					

Performing the Partitioning Process

To partition the library, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Library —> Partitions

The Partitions Dialog displays the number of logical libraries that are currently partitioned (see Figure 161).

```
┌─────────────────────────────────────────┐
│ ┌──┐ ┌───────────────────┐ ┌─────────┐  │
│ │  │ │ Ultrium Tape Library│ │ ⊃⊂    ⊡ │  │
│ │  │ │      OFFLINE        │ ├─────────┤  │
│ │  │ │ WED 03/12/03 19:59  │ │ ⊃⊂    ⊡ │  │
│ 🔓 │Partitions available │ ├─────────┤  │
│ ┌──┐│  1 part MB=storage  │ │ ⊃⊂    ⊡ │  │
│ │  ││ >1 part MB=IE       │ ├─────────┤  │
│ ✎  ││  2 part MB=IE       │ │ ⊃⊂    ⊡ │  │
│ └──┘│  3 part MB=IE       │ └─────────┘  │
│ ┌──────┐ ┌──────┐ ┌──────┐ ┌──────┐     │
│ │  OK  │ │      │ │ Next │ │Cancel│     │
│ └──────┘ └──────┘ └──────┘ └──────┘     │
└─────────────────────────────────────────┘
```
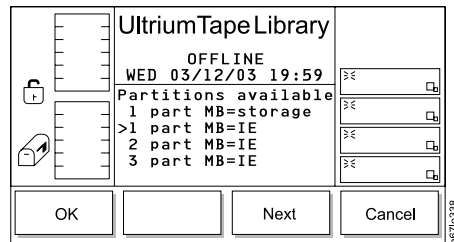
Figure 161. Partitions Dialog

The Partition Dialog contains the following information:

part   The quantity of logical libraries in the library. Valid values are from 1 to 3.

MB   Indicates that the I/O station is configured as storage or as an I/O station. Valid values are `storage` and `I/O`.

Perform one of the following:

- To accept the current quantity of logical libraries, press the button below the **OK** softkey.
- To change the quantity of logical libraries, press the button below the **Next** softkey until the quantity that you want displays in the `Partition available` field, then press the button below the **OK** softkey. To activate the changes, reboot the library.

Enabling and Disabling Automatic Cleaning

Whenever a drive needs cleaning, the Ultrium Scalable Tape Library can automatically clean it after you enable automatic cleaning and import a cleaning cartridge.

Notes:

1. Automatic cleaning is the default for the Ultrium Scalable Tape Library.
2. You cannot enable automatic cleaning if you have configured the slots in the I/O station as storage slots.
3. When you disable autoclean, the server stops all cleaning inquiries to the drive.

To enable or disable automatic cleaning, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Library —> More —> AutoClean

Figure 162. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 163).
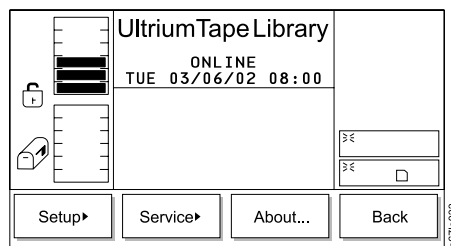
Figure 163. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 164 on page 145).
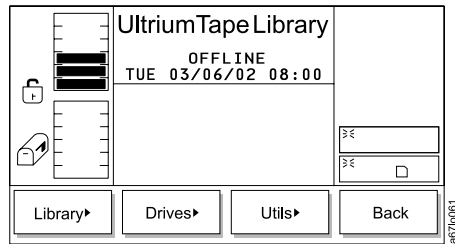
Figure 164. Setup Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 165).
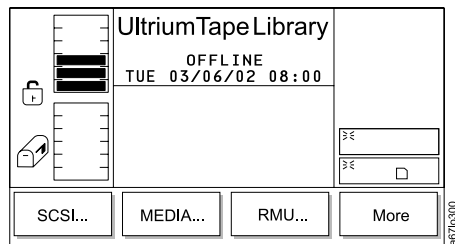
Figure 165. Library Submenu

4. Press the button below the **More** softkey. The More Dialog displays (see Figure 166).
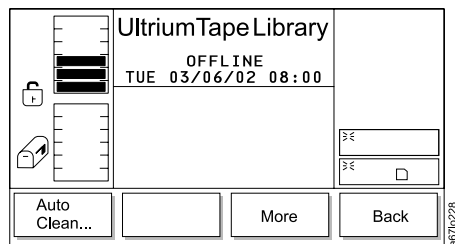
Figure 166. More Dialog

5. Press the button below the **AutoClean** softkey. The Autoclean Setup screen displays (see Figure 167).
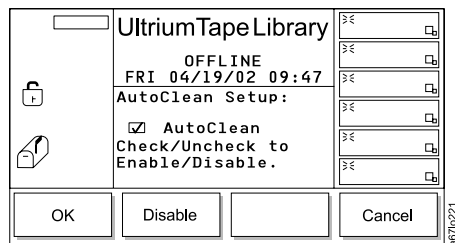
Figure 167. Autoclean Setup screen

6. Perform one of the following:

    * To enable automatic cleaning, press the button below the **Enable** softkey until the screen displays a checkmark in the checkbox beside the `AutoClean` field. The checkmark indicates that automatic cleaning is currently enabled.

    * To disable automatic cleaning, press the button below the **Disable** softkey until the checkmark disappears from the checkbox. The absence of a checkmark means that automatic cleaning is currently disabled.

7. Press the button below the **OK** softkey. The library enables or disables automatic cleaning and redisplays the More Dialog (see Figure 166 on page 145).

8. Perform one of the following:

    * To return to the Setup Menu (see Figure 164 on page 145), press the button below the **Back** softkey.

    * To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Importing the Cleaning Cartridge

Note: Cleaning cartridges are not required to be labeled, and are transparent and inaccessible to the server when they are at their fixed slot locations.

Before you import a cleaning cartridge, make sure that autoclean is enabled (see "Enabling and Disabling Automatic Cleaning" on page 144).

Shortcut: **Main Menu (initial screen) —> Command —> I/O Station —> AutoClean —> Import**

Figure 168. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 169 on page 147).

Figure 169. Command Menu

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 170).

Figure 170. I/O Station Submenu

3. Press the button below the **AutoClean** softkey. The AutoClean Dialog displays (see Figure 171) with the following information about cleaning cartridges and cleaning slots in the library.
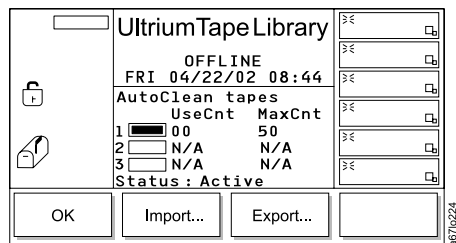
Figure 171. AutoClean Dialog

| 1 ▬ Represents the quantity of storage slots that are designated for a cleaning cartridge. A cleaning slot is located at the top of columns 2, 4, and 5. In the AutoClean Dialog, slot 1 refers to the slot in column 2, slot 2 refers to the slot in column 4, and slot 3 refers to the slot in column 5. A shaded box means that the slot is occupied; a box that contains no shading means that the slot is empty.

UseCnt   The number of times that the cleaning cartridge has been used to clean a drive. Valid values are 0 through 99, or EXP for an expired cartridge.

MaxCnt   The number of times that the cleaning cartridge can be used to clean a drive. Valid values are 50 (the maximum) or EXP for an expired cartridge. Values in the MaxCnt column are read only.

Status   Indicates whether the AutoClean function is currently enabled (Active) or disabled (Inactive).

4. If no cleaning cartridge is present in the library (each of the three rectangular boxes contain no shading), import a cleaning cartridge by pressing the button below the **Import** softkey. The Cleaning Tape screen displays (see Figure 172).

   Note: The Import softkey is only available if there are empty cleaning cartridge storage slots.
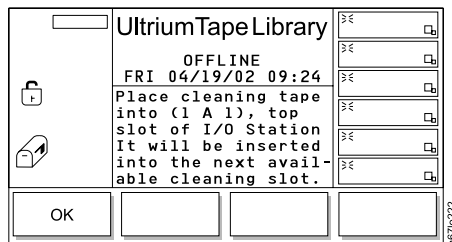
Figure 172. Cleaning Tape screen

5. Open the door of the I/O station and place a cleaning cartridge into the top slot of the I/O station. Use only the top slot of the I/O station.

6. Close the door of the I/O station. The library executes the TEACH and INVENTORY procedures.

7. After the TEACH and INVENTORY (Scanning) procedures are complete, press the button below the **OK** softkey. The Set Use and Max Count Dialog displays (see Figure 173).

```
┌──────────────────────────────┬──────────┐
│ �äää UltriumTapeLibrary       │ ░ꢀ    ꢀ │
│                              │ ░ꢀ    ꢀ │
│        OFFLINE               │ ░ꢀ    ꢀ │
│   FRI 04/19/02 09:34         │ ░ꢀ    ꢀ │
│  AutoClean tapes             │ ░ꢀ    ꢀ │
│                              │ ░ꢀ    ꢀ │
│  Enter tape info             │ ░ꢀ    ꢀ │
│  Use-Count : █0              │          │
│  Max-Count :                 │          │
├──────────┬─────────┬─────────┼──────────┤
│    OK    │   Up    │  Next   │  Cancel  │
└──────────┴─────────┴─────────┴──────────┘
```
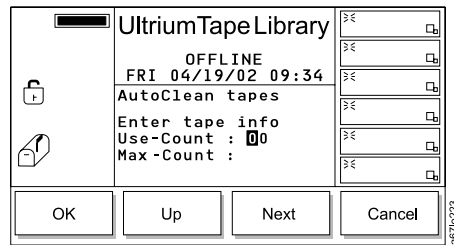
Figure 173. Set Use and Max Count Dialog

8. If known, specify the number of times that the cleaning cartridge has been used by pressing the button below the **Up** or **Next** softkeys to increase the value in the `Use-Count` field.

9. Press the button below the **OK** softkey. The library imports the cleaning cartridge to the drive and cleaning begins. When the cleaning is finished, the library displays the message `Requested command is now complete.`

10. Perform one of the following:
   - To return to the AutoClean Dialog, press the button below the **OK** softkey.
   - To return to the Main Menu press the button below the **OK** softkey twice, then press the button below the **Back** softkey until the Main Menu displays.

Handling Errors

Table 21. Handling errors during automatic cleaning

Error	Cause	Required Action
Non-cleaning cartridge imported	User error.	Export the non-cleaning cartridge to the I/O station (ignore the message about the cartridge being expired).
Missing cleaning cartridge	The cleaning cartridge was manually removed while the door was open.	Open the door of the library and manually insert a cleaning cartridge into the slot from which it is missing.
Unexpected cleaning slot full	A non-cleaning cartridge was placed into the fixed slot while the door was open.	Remove the non-cleaning cartridge from the fixed slot.
Cleaning tape usage limit met	The cartridge used its allotted cleanings.	Export the expired cartridge to the I/O station and discard it.
All cleaning tapes used	All cartridges used their allotted cleanings.	Export the expired cartridges to the I/O station and discard them. Insert new cleaning cartridges into the library.
Failed get or put of cleaning tape	Electromechanical failure.	Note the SAC code that displays on the operator panel, then refer to "Service Action Codes" on page 297 to resolve the error.

Table 21. Handling errors during automatic cleaning (continued)

Error	Cause	Required Action
Power outage while handling cleaning tape	User error or random power failure.	Access the automatic cleaning function and determine which columns contain cleaning cartridges (see "Importing the Cleaning Cartridge" on page 146). Open the door of the library and inspect the columns to determine from which slot the cleaning cartridge is missing. Manually remove the cleaning cartridge from the gripper and return it to the slot from which it is missing.
Power outage while cleaning drive	User error or random power failure.	Reapply the power and allow the drive to complete the operation.

Exporting the Cleaning Cartridge

To export a cleaning cartridge, perform the following procedure.

Before you export a cleaning cartridge, make sure that autoclean is enabled (see "Enabling and Disabling Automatic Cleaning" on page 144).

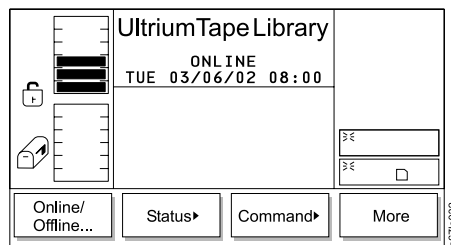**Shortcut:** <u>Main Menu (initial screen)</u> —> Command —> I/O Station —> AutoClean —> Export

Figure 174. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 175).
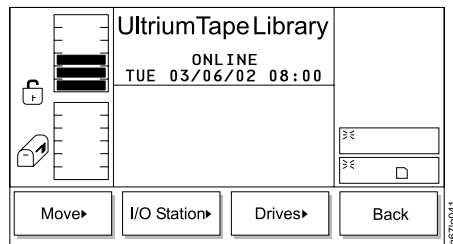

Figure 175. Command Menu

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 176 on page 151).

```
        ┌───────────────────────┐
     ┌──┤UltriumTapeLibrary     │
     │  │     OFFLINE            │
     │  │ TUE 03/06/02 08:00     │
   🔓 │  │                       │
     │  │                       │
   ✏️ │  │                       │
        │                ✂️     │
        │                ✂️  ▭  │
        └───────────────────────┘
   ┌──────┬──────┬──────┬──────┐
   │Import│ Auto │Export│ Back │
   │      │Clean.│  ... │      │
   └──────┴──────┴──────┴──────┘
```
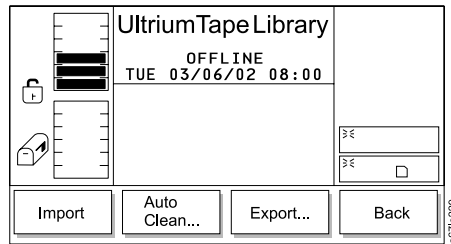
Figure 176. I/O Station Submenu

3. Press the button below the **AutoClean** softkey. The AutoClean Dialog displays (see Figure 177).


```
   ┌───┐  ┌───────────────────┐ ✂️ ▭
   │   │  │UltriumTapeLibrary │ ✂️ ▭
   │   │  │     OFFLINE       │ ✂️ ▭
   │   │  │ FRI 04/22/02 08:44│ ✂️ ▭
   🔓 │  │AutoClean tapes    │ ✂️ ▭
   │   │  │     UseCnt  MaxCnt│ ✂️ ▭
   ✏️ │  │1▇▇ 00     50      │ ✂️ ▭
        │2   N/A     N/A     │
        │3   N/A     N/A     │
        │Status:Active      │
   ┌─────┬──────┬──────┬──────┐
   │ OK  │Import│Export│      │
   │     │ ...  │ ...  │      │
   └─────┴──────┴──────┴──────┘
```
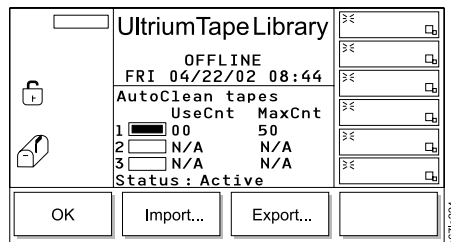
Figure 177. AutoClean Dialog

4. Press the button below the **Export** softkey. The Export Cleaning Tape Dialog displays (see Figure 178).

   Note: The Export softkey is only available if at least one cleaning cartridge has been detected.


```
   ┌───┐  ┌───────────────────┐ ✂️ ▭
   │   │  │UltriumTapeLibrary │ ✂️ ▭
   │   │  │     OFFLINE       │ ✂️ ▭
   │   │  │ FRI 04/19/02 09:23│ ✂️ ▭
   🔓 │  │AutoClean tapes    │ ✂️ ▭
   │   │  │     UseCnt MaxCnt │ ✂️ ▭
   ✏️ │  │1▇▇ ◄24 ──50 ──    │ ✂️ ▭
        │2   N/A    N/A      │
        │3   N/A    N/A      │
        │Status : Active    │
   ┌─────┬──────┬──────┬──────┐
   │ OK  │ Down │Select│Cancel│
   └─────┴──────┴──────┴──────┘
```
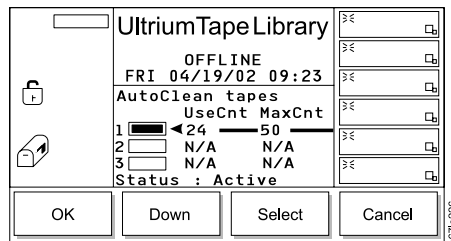
Figure 178. Export Cleaning Tape Dialog

5. Press the button below the **Up** or **Down** softkey to specify the cleaning slot that you want, then press the button below the **Select** softkey. The library exports the cleaning cartridge from the slot that you specified to a slot in the I/O station. When the export is finished, the library displays the message `Requested command is now complete.`

6. Perform one of the following:
   - To return to the AutoClean Dialog, press the button below the **OK** softkey.
   - To return to the Main Menu press the button below the **OK** softkey twice, then press the button below the **Back** softkey until the Main Menu displays.

7. Remove the cleaning cartridge from the I/O station.

8. Press the button below the **Online/Offline** softkey to place the library in the online state.

Exporting a Cartridge from the Library

To export a tape cartridge from the library to the I/O station, perform the following steps. You can select a maximum of 12 tape cartridges during a single export operation.

Shortcut: **Main Menu (initial screen) —> Command —> I/O Station —> Export**
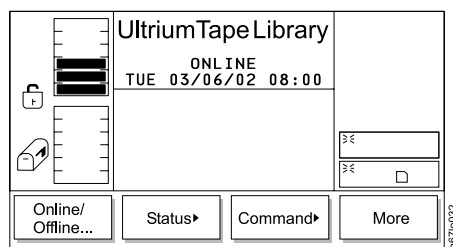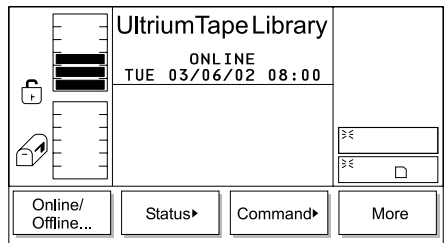

Figure 179. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 180).
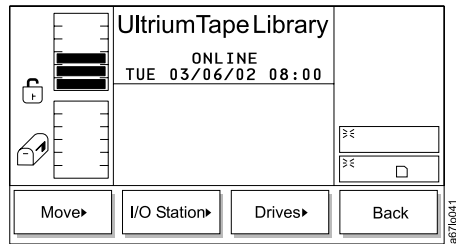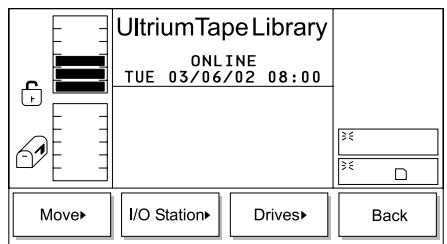

Figure 180. Command Menu

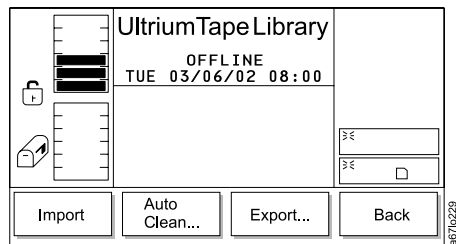2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 181).
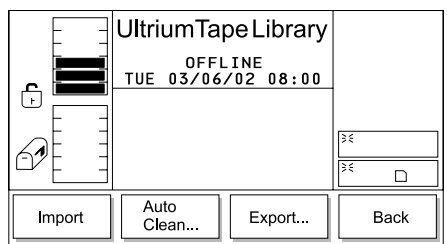
Figure 181. I/O Station Submenu

3. Press the button below the **Export** softkey. The Export Dialog displays a message that describes the export procedure (see Figure 182 on page 153).
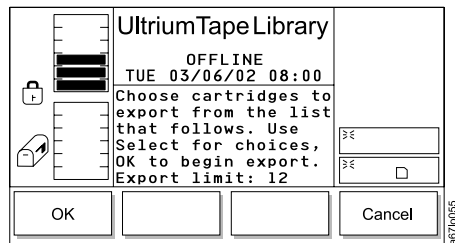
Figure 182. Export Dialog

4. Press the button below the **OK** softkey. The Export List Dialog displays a list of tape cartridges that are present in the library (see Figure 183). The cartridges are listed by their volume serial numbers (VOLSERs) and physical addresses.
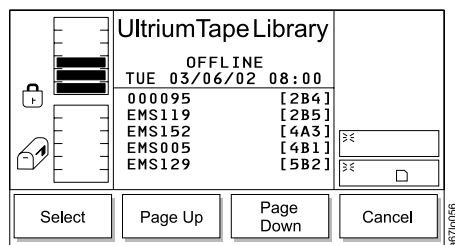
Figure 183. Export List Dialog

5. Press the button below the **Page Up** or **Page Down** softkey to locate the screen that contains the cartridge that you want, then press the button below the **Select** softkey. The selection cursor displays beside the first item on the screen (see Figure 184).

> **Note:** To return to the Export List Dialog to make additional selections or cancel the export operation, press the button below the **Pages** softkey.
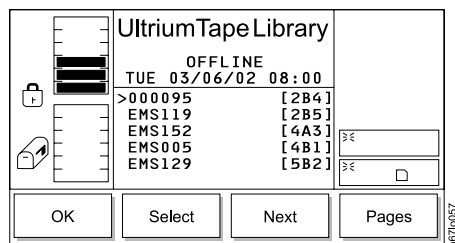
Figure 184. Export Select Dialog

6. Perform one or both of the following:
   - To export the first cartridge in the list, press the button below the **Select** softkey to highlight and select the cartridge.
   - To export a cartridge other then the first one in the list, press the button below the **Next** softkey to move the selection cursor to the cartridge that you want. Press the button below the **Select** softkey to highlight and select the cartridge. You can highlight and select up to 12 cartridges at a time.

7. Press the button below **OK** softkey. The picker moves the cartridge that you specified to the I/O station and the library displays the message `Requested command is now complete.`

8. To return to the I/O Station Submenu (see Figure 181 on page 152), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Unloading a Cartridge from a Drive

To unload a tape cartridge from a drive, perform the following steps.

Shortcut: **Main Menu (initial screen) —> Command —> Drives —> Unload**

Figure 185. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 186).
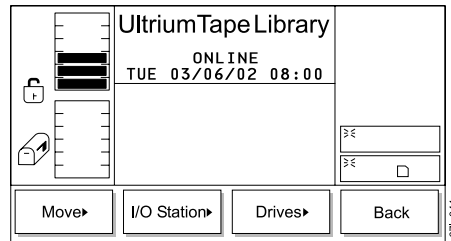
Figure 186. Command Menu

2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 187).
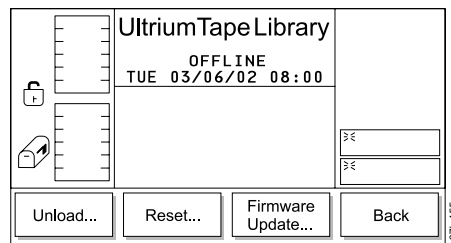
Figure 187. Drives Submenu

3. Press the button below the **Unload** softkey. The Unload Dialog displays (see Figure 188 on page 156).
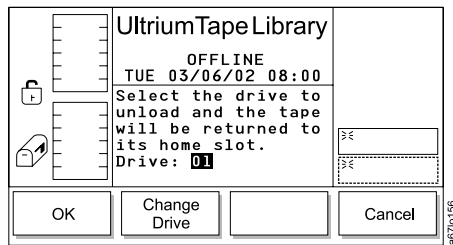
Figure 188. Unload Dialog

4. Perform one of the following:
   - To unload the cartridge from the currently displayed drive, press the button below the **OK** softkey.
   - To unload the cartridge from another drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays (drive numbers range from 01 to 06). Then, press the button below the **OK** softkey.

   The drive unloads the cartridge, the picker places it in its original slot, and the library displays the message `Requested command is now complete.`
5. To return to the Drives Submenu (see Figure 187 on page 155), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Resetting a Tape Drive

You can select the type of reset to perform on a tape drive. A soft reset causes the library to issue a reboot command and reinitialize the drive without turning off its power. A hard reset causes the library to cycle power to the drive (turn it off, then on). To reset a drive, perform the following steps.

Shortcut: Main Menu (initial screen) —> Command —> Drives —> Reset

Figure 189. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 190).
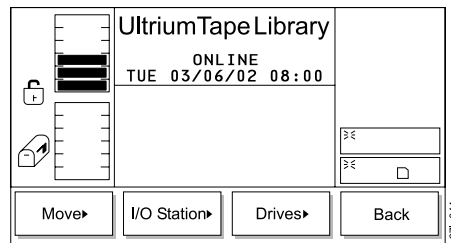
Figure 190. Command Menu

2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 191).
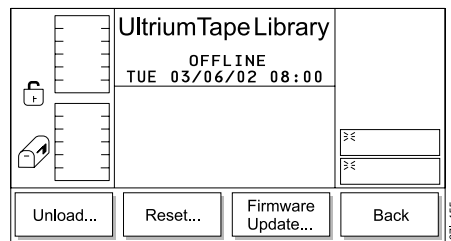
Figure 191. Drives Submenu

3. Press the button below the **Reset** softkey. The Reset Dialog displays with the message `Make sure the drive selected is OFFLINE!` (see Figure 192 on page 158). Ensure that the drive has completed all operations and that no backup applications are running.
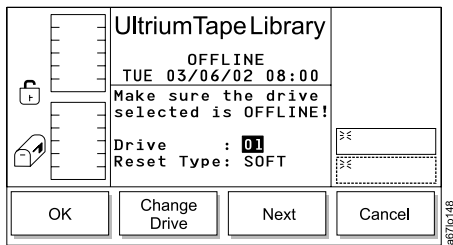
Figure 192. Reset Dialog

4. Perform one of the following:
   - To reset the currently displayed drive, press the button below the **Next** softkey.
   - To reset a drive other than the one that is currently displayed, press the button below the **Change Drive** softkey until the number of the drive that you want displays in the `Drive` field (drive numbers range from 01 to 06). Then, press the button below the **Next** softkey.

   The Reset Type Dialog displays (see Figure 193) and the selection cursor moves to the `Reset Type` field.
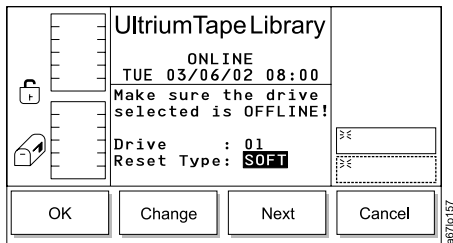
Figure 193. Reset Type Dialog

5. To change the type of reset (hard or soft), press the button below the **Change** softkey. A soft reset causes the library to issue a drive reset command; a hard reset causes the library to remove power from the drive.
6. To reset the selected drive, press the button below the **OK** softkey. The library resets the drive and displays the message `Requested command is now complete.`
7. To return to the Reset Dialog (see Figure 192), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK —> Cancel —> Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Viewing or Changing the Library's SCSI Settings

Note: This procedure is valid only for libraries without the Multi-Path feature.

The library's SCSI settings include its SCSI ID, the number of times the library retries a SCSI operation, whether SCSI parity is enabled or disabled, and the type of sign-on emulation that the library uses. To view or change the library's SCSI settings, perform the following steps.

Note: If you change the library's SCSI settings, you must cycle power to the library (turn it off, then on) to make the changes take effect.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Library —> SCSI
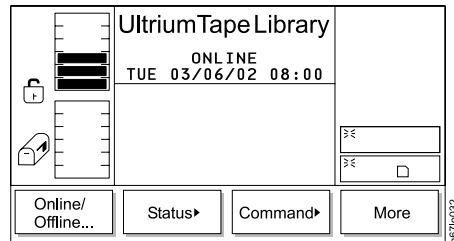
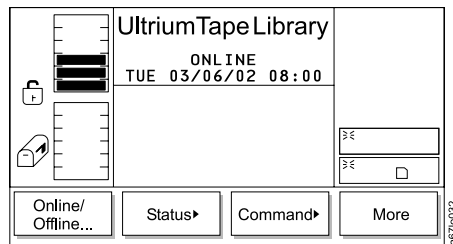*Figure 194. Main Menu (initial screen)*

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 195).

Figure 195. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 196 on page 160).

Figure 196. Setup Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 197).
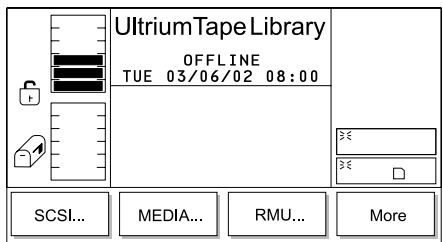
Figure 197. Library Submenu

4. Press the button below the **SCSI** softkey. The SCSI Dialog displays (see Figure 198).
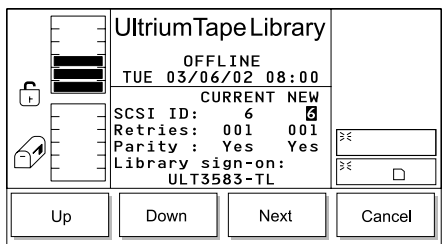
Figure 198. SCSI Dialog

The SCSI Dialog allows you to set the SCSI ID. The Ultrium Scalable Tape Library consists of up to seven SCSI devices: the library and six drives. The default settings for the SCSI IDs are 6 for the library and 0 through 5 for the drives.

Notes:

a. Do not select an ID that is already in use on the same SCSI bus.

b. Do not select the SCSI ID of the SCSI host adapter card. On the SCSI bus, any initiator (such as a host adapter card) that needs to communicate with the library must have its SCSI ID set from 0 to 7. The SCSI ID of the SCSI host adapter card is usually higher than any device on the SCSI bus. Generally, the SCSI ID for the host adapter is 7.

To determine whether a SCSI ID is already in use, see your system administrator.

The SCSI Dialog contains the current and new (if you decide to change them) SCSI settings for the library. It includes the following information:

SCSI ID The SCSI ID of the library. Valid values are 0 through 7.

Retries The number of times that the library attempts to perform out a SCSI command that is issued by a host. Valid values are 0 through 255.

Parity Indication of whether SCSI parity is enabled (Yes) or disabled (No).

Library sign-on
The type of machine that the library can emulate. This value is ULT3583–TL and cannot be altered.

5. Perform one of the following:
   - To accept the current settings, press the button below the **Cancel** softkey. The Library Submenu redisplays (see Figure 197 on page 160). To return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.
   - To change the value in one or more fields, cycle through each field by pressing the button below the **Next** softkey until the selection cursor highlights the field in the New column. Perform the following:
     - To change the SCSI ID of the library, press the button below the **Next** softkey until the selection cursor highlights the value in the New column of the SCSI ID field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
     - To change the number of times that the library retries a SCSI operation, press the button below the **Next** softkey until the selection cursor highlights the value in the New column of the Retries field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
     - To enable or disable parity, press the button below the **Next** softkey until the selection cursor highlights the value in the New column of the Parity field. Press the button below the **Yes/No** softkey until Yes (enable parity) or No (disable parity) displays.

6. Verify that the new settings are correct on the display, then cycle through any remaining fields and press the button below the **OK** softkey to accept the new settings. The library displays the message `The new values are set. They will take effect when the library is rebooted. Do you want to reboot now?`

7. Restart the library to make the new settings take effect.

Setting up Remote Communication with the Library

From the Web

The configuration page (see Figure 199) is protected by a password and allows you to configure the remote management unit's network settings (including SNMP). You perform the initial RMU network configuration through the library's operator panel during library installation and setup (see "Step 7. Configuring the RMU" on page 70).

Figure 199. Configuration page

From the Operator Panel

To set up remote communication to the Ultrium Scalable Tape Library, perform the following steps.

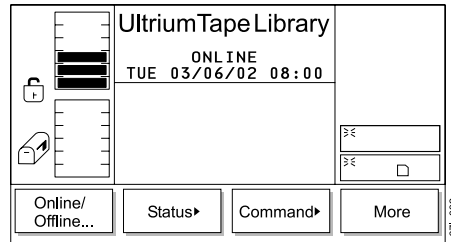**Shortcut: Main Menu (initial screen) —> More —> Setup —> Library —> RMU**
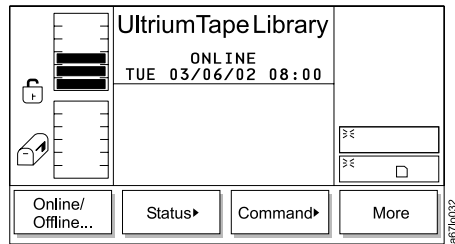
Figure 200. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 201).
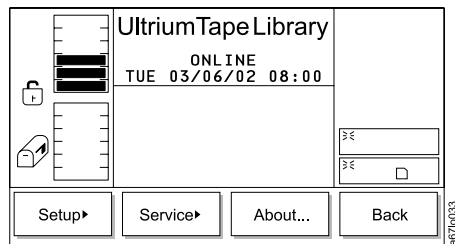
Figure 201. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 202).
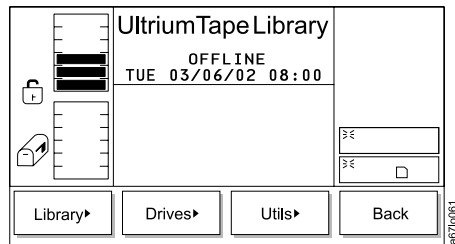
Figure 202. Setup Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 203 on page 164).

Figure 203. Library Submenu

4. Press the button below the **RMU** softkey. The Confirm Changes Dialog displays (see Figure 204) with the following information:

IP The Internet protocol (IP) address of the library. The IP address is an identifier that is unique to the library and is necessary for communication with the server. Valid values are 000.000.000.000 through 255.255.255.255.

Sub The subnet mask address of the library. The subnet mask address identifies the library's local area network (LAN). Valid values are 000.000.000.000 through 255.255.255.255.

Gate The gateway address, which is the location at which networks attach to each other. Valid values are 000.000.000.000 through 255.255.255.255.

Name The hostname that you assign to the RMU for communication with the library through the RMU. Valid values are A through Z and 0 through 9.
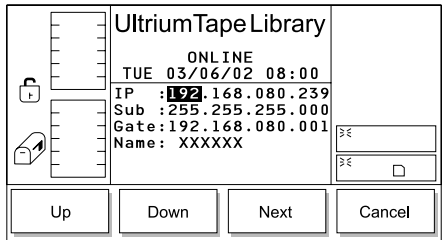
Figure 204. Confirm Changes Dialog

5. To change the value in one or more fields, cycle through each field by pressing the button below the **Next** softkey until the selection cursor highlights the value in the address that you want to change (an address is divided into four sets of characters that are separated by periods; each set is called an octet). Perform the following:

   • To change the library's IP address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the IP field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.

   • To change the library's subnet mask address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the Sub field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.

- To change the gateway address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the Gate field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.

- To change the host name that is assigned to the RMU, press the button below the **Next** softkey until the selection cursor highlights the first character in the Name field. Press the button below the **Up** or **Down** softkeys to increase or decrease the alphabetical or numeric value. Repeat for each character in the new host name.

6. Verify that the new settings are correct on the display, then press the button below the **Next** softkey until the Confirm Changes Dialog displays (see Figure 205).
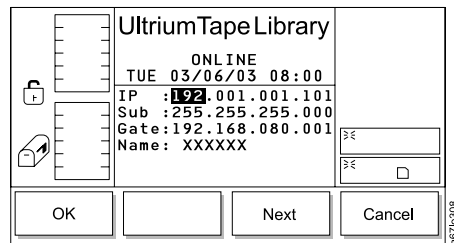
Figure 205. Confirm Changes Dialog

7. To accept the changes and establish the settings for remote communication between library and the network, press the button below the **OK** softkey. The Library Submenu redisplays (see Figure 203 on page 164). To return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Viewing or Changing a Drive's SCSI ID

To view or change a drive's SCSI ID, perform the following steps.

Shortcut: **Main Menu (initial screen) —> More —> Setup —> Drives —> SCSI**

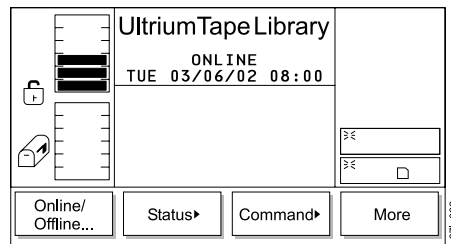*Figure 206. Main Menu (initial screen)*

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 207).

Figure 207. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 208).

Figure 208. Setup Menu

3. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 209 on page 167).
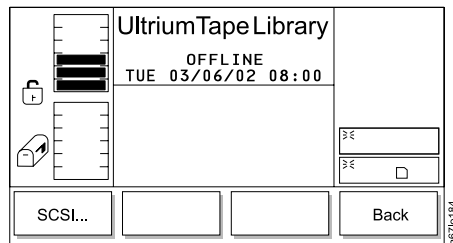
Figure 209. Drives Submenu

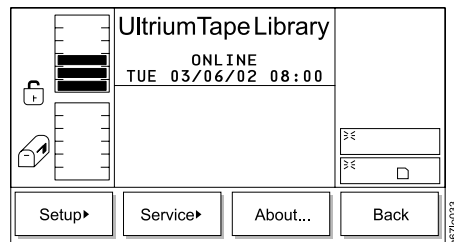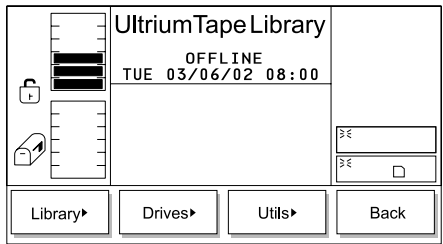4. Press the button below the **SCSI** softkey. The Drive SCSI Dialog displays (see Figure 210). The screen may vary, depending on whether your library has the Multi-Path feature.
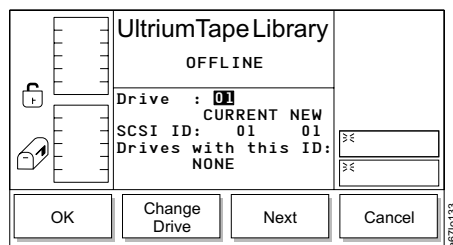
Figure 210. Drive SCSI Dialog for Drives without the Multi-Path Feature

The Ultrium Scalable Tape Library consists of up to seven SCSI devices: the library and six drives. The default settings for the SCSI IDs are 6 for the library and 0 through 5 for the drives.

Notes:

a. Do not select an ID that is already in use on the same SCSI bus.

b. Do not select the SCSI ID of the SCSI host adapter card. On the SCSI bus, any initiator (such as a host adapter card) that needs to communicate with the library must have its SCSI ID set from 0 to 7. The SCSI ID of the SCSI host adapter card is usually higher than any device on the SCSI bus. Generally, the SCSI ID for the host adapter is 7.

To determine whether a SCSI ID is already in use, see your system administrator.

The Drive SCSI Dialog contains the current and new (if you decide to change them) SCSI settings for the drives. Settings are presented individually for each drive. The Drive SCSI Dialog includes the following information:

Drive   The number of the drive. The number is based on the location of the drive in the drive column. The numbers range from 01 to 06, from bottom to top.

SCSI ID   The current and new SCSI ID of the selected drive. Valid values are 00 through 15.

Control path   A logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library.

Drives with this ID The drive that has the same SCSI ID as the selected drive. This field is for information only.

5. Perform one or more of the following:

   - To accept the current settings, press the button below the **Cancel** softkey. The Drives Submenu redisplays (see Figure 209 on page 167).

   - To change the value in one or more fields, perform the following:

     – To change the number of the drive, press the button below the **Change Drive** softkey until the value that you want displays.

     – To change the SCSI ID of the drive, press the button below the **Next** softkey until the selection cursor highlights the value in the `New` column of the `SCSI ID` field. Press the button below the **Up** or **Down** softkeys until the SCSI ID that you want displays. Verify that the new settings are correct on the display and that no other drives have the SCSI ID that you specified (ensure that the field `Drives with this ID: NONE` displays). Press the button below the **Next** softkey, then **OK** softkey to accept the new settings. The library resets the drives with their new IDs and displays the message `Requested command is now complete.` Press the button below the **OK** softkey to return to the Drives Submenu (see Figure 209 on page 167). Wait approximately one minute for the drive to accept the changes.

6. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Viewing or Changing a Loop ID

The Ultrium Scalable Tape Library assigns a default Loop ID to each Ultrium Tape Drive that uses a Fibre Channel interface. To view or change a drive's Fibre Channel Loop ID, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Drives —> Loop/SCSI

The Loop submenu displays (see Figure 211). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the `Drive:` field. The value of its Loop ID displays in the `LOOP ID: CURRENT` field.
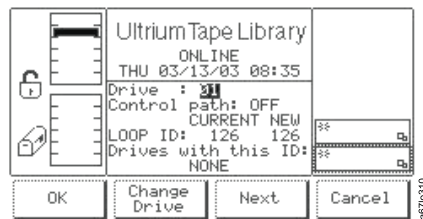
Figure 211. Loop Submenu

To change the current drive, press the button below the **Change Drive** softkey until the number of the drive you want displays in the `Drive:` field, then select **OK**.

To change the Loop ID setting for the drive, perform the following steps:

1. Press the button below the **Next** softkey. The Loop ID Dialog displays (see Figure 212).
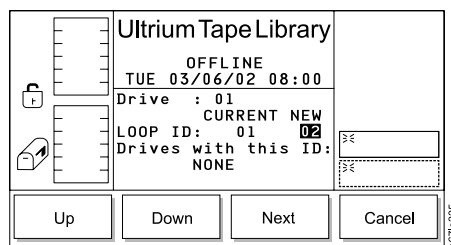
Figure 212. Loop ID Dialog

2. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the `LOOP ID: NEW` field.
3. Press the button below the **Next** softkey until the **OK** softkey displays.
4. Press the button below the **OK** softkey to accept the new ID.
5. To activate the new Loop ID, cycle power to the library (turn it off, then on again).

Changing the Date and Time

From the Web

The configuration page (see Figure 213) is protected by a password and allows you to set the date and time for the RMU.

Figure 213. Configuration page

From the Operator Panel

To set the date and time in the library, perform the following steps.

Shortcut: **Main Menu (initial screen) —> More —> Setup —> Utils —> Date/Time**

Figure 214. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 215 on page 171).

Figure 215. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 216).

Figure 216. Setup Menu

3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 217 on page 172).

Figure 217. Utils Submenu

4. Press the button below the **Date/Time** softkey. The Date/Time Dialog displays (see Figure 218) with the following information:

Year   The year of the century. Valid values are 00 through 99.

Month   The month of the year. Valid values are 0 through 12.

Day   The day of the month. Valid values are 00 through 31.

Hour   The hour of the day. Valid values are 0 through 23.

Min   The minute of the hour. Valid values are 0 through 59.

Sec   The second of the minute. Valid values are 0 through 59.

Sync interface

                    Enable or disable synchronization of the date and time between the server and the library. Valid values are Yes or No.
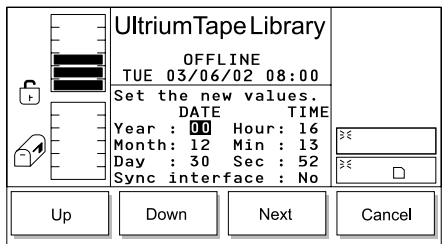
Figure 218. Date/Time Dialog

5. Perform one or more of the following:
   - To change the value in the `Year`, `Month`, `Day`, `Hour`, `Min`, or `Sec` fields, press the button below the **Next** softkey until the selection cursor highlights that value. Press the button below the **Up** or **Down** softkeys until the value that you want displays. Press the **Next** softkey until the **OK** softkey displays.
   - To synchronize the date and time between the server and the library, press the button below the **Next** softkey until the selection cursor highlights the value in the `Sync interface` field. Press the button below the **Yes/No** softkey until Yes (enable synchronization) or No (disable synchronization) displays.

6. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to accept the new date and time. The Utils Submenu redisplays (see Figure 217 on page 172).

7. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Enabling and Disabling Backlighting and Audio

To enable or disable the operator panel's backlighting and the audio, perform the following steps.

Note: If you change the setting for backlighting and audio, you must cycle power to the library (turn it off, then on) to make the change take effect.

Shortcut: **Main Menu (initial screen) —> More —> Setup —> Utils —> Config**

Figure 219. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 220).

Figure 220. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 221).

Figure 221. Setup Menu

3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 222 on page 175).
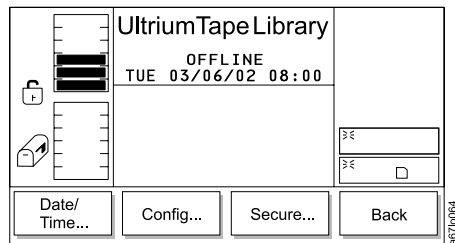
Figure 222. Utils Submenu

4. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 223) with the following information:
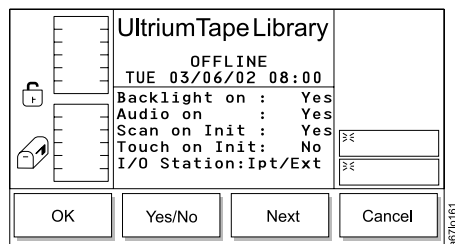
Figure 223. Config Dialog

5. Perform one or more of the following:
   - To turn the backlighting of the operator panel on or off, press the button below the **Next** softkey until the selection cursor highlights the value in the `Backlight on` field. Press the button below the **Yes/No** softkey until Yes (enable backlighting) or No (disable backlighting) displays.
   - To turn the audio on or off, press the button below the **Next** softkey until the selection cursor highlights the value in the `Audio on` field. Press the button below the **Yes/No** softkey until Yes (enable audio) or No (disable audio) displays.
6. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to accept the new backlighting and audio settings. The Utils Submenu redisplays (see Figure 222).
7. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.
8. To activate the changes, cycle power to the library (turn it off, then on).

Choosing the Method of Inventory

The library offers two ways to perform an inventory whenever you power it on (initialization). You can configure the library so that it scans the bar codes on each labeled cartridge or touches each unlabeled cartridge with the fingers of the picker. Each method provides an inventory of the library's cartridges. The scanning method is the default and takes less time than the touching method.

To choose the method of inventory during initialization, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Utils —> Config
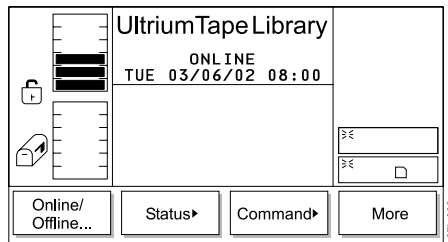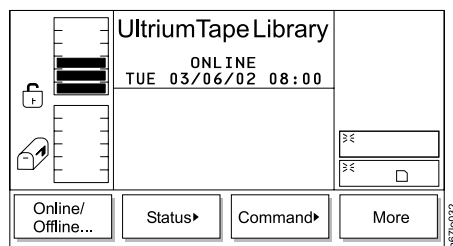

Figure 224. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 225).
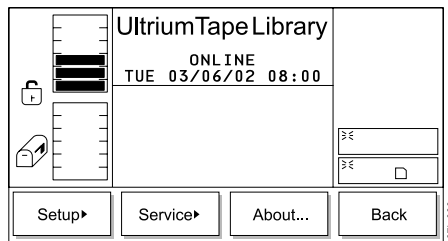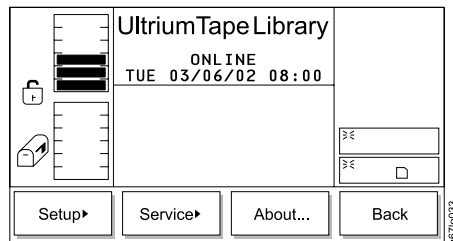

Figure 225. Main Menu (alternate screen)

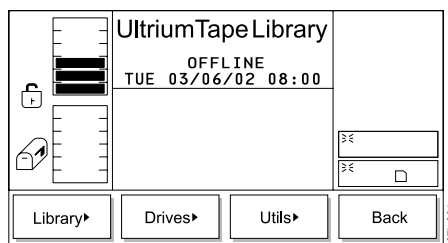2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 226).
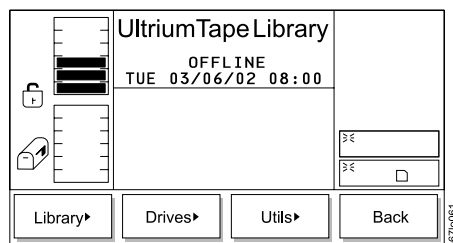
Figure 226. Setup Menu

3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 227).
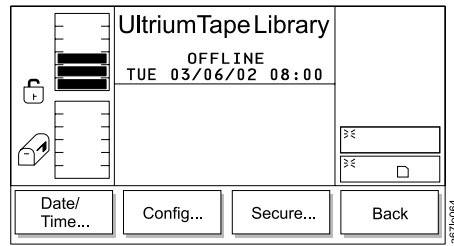
Figure 227. Utils Submenu

4. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 228) with the following information:
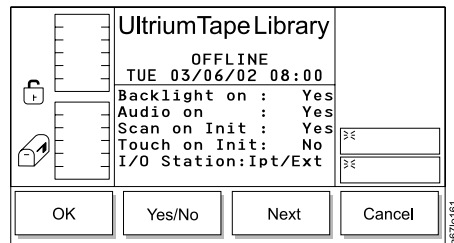
Figure 228. Config Dialog

5. Perform one of the following:

- To cause the library to perform an inventory by scanning the bar codes on labeled cartridges, press the button below the **Next** softkey until the selection cursor highlights the value in the `Scan on Init` field. Press the button below the **Yes/No** softkey until Yes displays (enable scanning).

- To cause the library to perform an inventory by touching the cartridges, press the button below the **Next** softkey until the selection cursor highlights the value in the `Touch on Init` field. Press the button below the **Yes/No** softkey until Yes displays (enable touching).

   Note: To avoid an illegal operation, if you set `Scan on Init` to `Yes`, you must set `Touch on Init` to `No`; similarly, if you set `Touch on Init` to `Yes`, you must set `Scan on Init` to `No`.

6. Verify that the new setting is correct on the display, then press the button below the **OK** softkey to accept the new inventory setting. The Utils Submenu redisplays (see Figure 227).

7. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

8. To activate the new setting, cycle power to the library (turn it off, then on).

Configuring the I/O Station as Storage Slots

To configure the I/O station as storage slots, perform the following steps.

Note: If you configure the I/O station as storage slots, you must cycle power to the library (turn it off, then on) to make the change take effect.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Utils —> Config

Figure 229. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 230).

Figure 230. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 231).

Figure 231. Setup Menu

3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 232 on page 179).
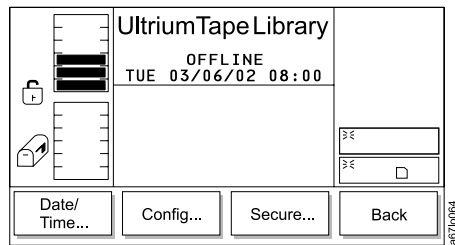
Figure 232. Utils Submenu

4. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 233) with the following information:
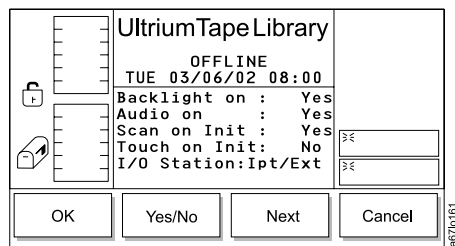
Figure 233. Config Dialog

5. Press the button below the **Next** softkey until the selection cursor highlights the value in the `I/O Station` field. The screen automatically refreshes and the `I/O Station` field changes to `I/O: Import/Export`.

6. Perform one of the following:
   * To configure the I/O station as an import and export location, press the button below the **Change** softkey until `Imprt/Exprt` displays.
   * To configure the I/O station as cartridge storage slots, press the button below the **Change** softkey until `Storage` displays.

7. Verify that the new setting is correct on the display, then press the button below the **OK** softkey to accept the setting. The library displays a message that it must reboot to make the changes. Press the button below the **OK** softkey. The Utils Submenu redisplays (see Figure 232).

8. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

9. To activate the new setting, cycle power to the library (turn it off, then on).

Enabling Security

The Enable Security feature allows you to protect your data. The default setting is Disable Security, but you can enable security by using the following procedure.

Note: When security is enabled, the library will prompt you for your password each time that you attempt to access certain protected procedures.

To enable security on the library, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Utils —> Secure
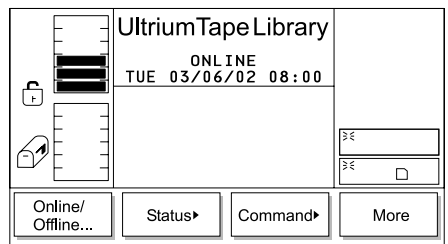
Figure 234. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 235).

Figure 235. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 236).

Figure 236. Setup Menu

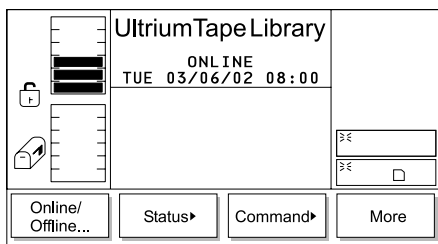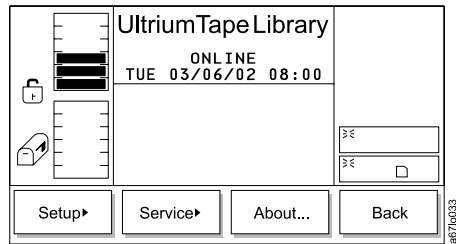3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 237).
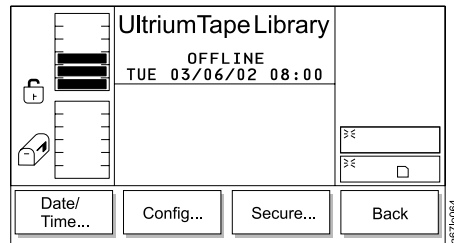
Figure 237. Utils Submenu

4. Press the button below the **Secure** softkey. The Secure Dialog displays (see Figure 238).

Figure 238. Secure Dialog

5. Press the button below the **Yes/No** softkey until a checkmark displays in the checkbox beside the `Enable Security` field. The library displays the message `Security is now ON.`

6. Press the button below the **OK** softkey to redisplay the Secure Dialog and view the new setting.

7. To return to the Utils Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Changing Your Password

You change your RMU password from the web and your operator panel security password from the operator panel. To change your RMU password from the web, see "Configuration" on page 87. When changing your password, record it and place it in a secure location.

From the Operator Panel

Shortcut: **Main Menu (initial screen) —> More —> Setup —> Utils —> Secure**

Figure 239. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 240).

Figure 240. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 241).
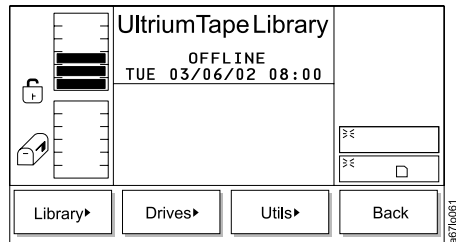

Figure 241. Setup Menu

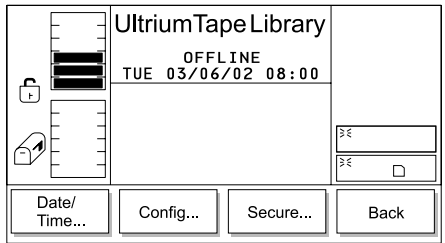3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 242 on page 183).
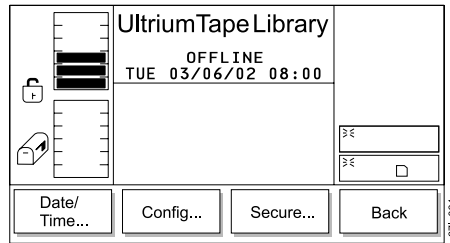
Figure 242. Utils Submenu

4. Press the button below the **Secure** softkey. The Enter Password Dialog displays (see Figure 243).

   Note: If security is enabled, you must enter the existing or default password to display the Secure Dialog (see Figure 244).
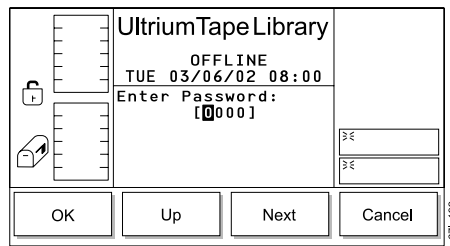
Figure 243. Enter Password Dialog

5. Enter your existing password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the New field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value.

6. Press the button below the **OK** softkey. The Secure Dialog screen displays (see Figure 244).

   Note: In Figure 244, the absence of a checkmark in the checkbox beside the Enable Security field indicates that security has not been enabled.
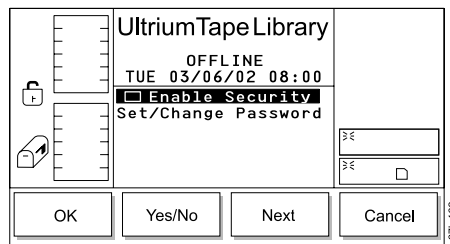
Figure 244. Secure Dialog

7. Press the button below the **Next** softkey to highlight the Set/Change Password field.

8. Press the button below the **Change** softkey. The Set/Change Password Dialog displays (see Figure 245 on page 184).

```
┌─────────────────────────────┬───────┐
│        │UltriumTapeLibrary│          │
│        │     OFFLINE       │          │
│   🔓   │  TUE 03/06/02 08:00│         │
│        │Change Password:   │          │
│   ✏   │Old[▓000]  New[0000]│   ✂    │
│        │                   │─────────│
│        │                   │   ✂    │
├────────┴────────┬──────────┴─────────┤
│   OK   │   Up   │  Next  │   Cancel  │
└────────┴────────┴────────┴───────────┘
```
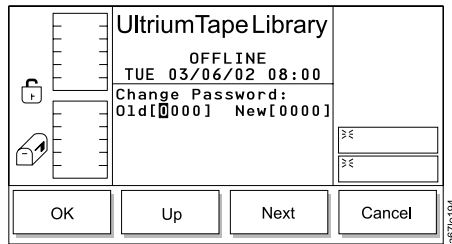
Figure 245. Set/Change Password Dialog

9. Enter the old password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the `Old` field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the old password, then press the button below the **OK** softkey to go to the `New` field.

10. Enter the new password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the `New` field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the new password.

11. Verify that the passwords are correct on the display, then press the button below the **OK** softkey to effect the change. The library displays the message **The password has been changed.**

12. To return to the Secure Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey.

13. To continue to return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Disabling Security

To disable security on the library, perform the following steps.

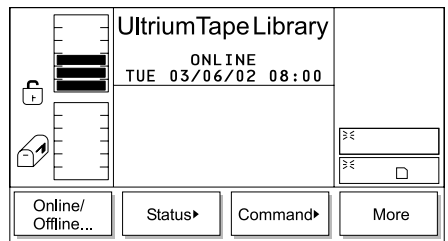**Shortcut:** **Main Menu (initial screen) —> More —> Setup —> Utils —> Secure**
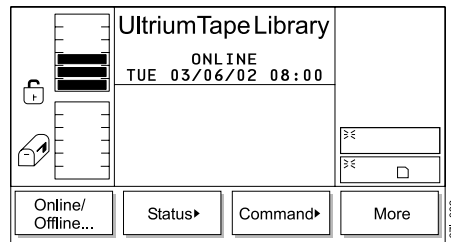
Figure 246. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 247).
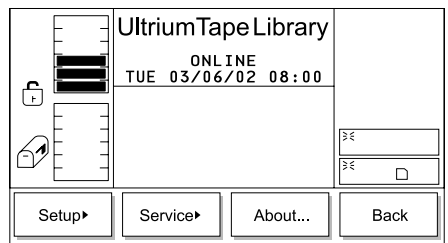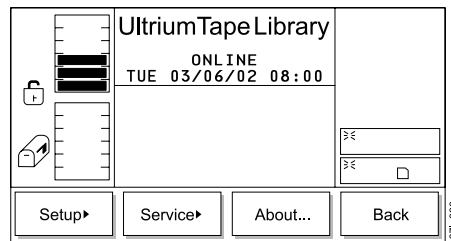

Figure 247. Main Menu (alternate screen)

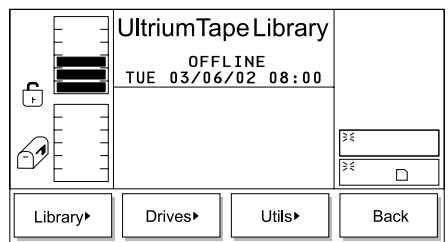2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 248).
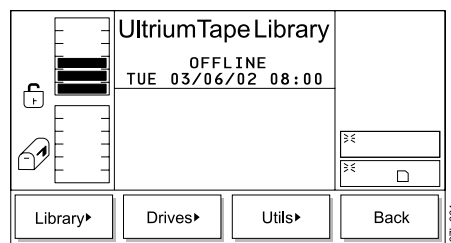
Figure 248. Setup Menu

3. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 249 on page 186).
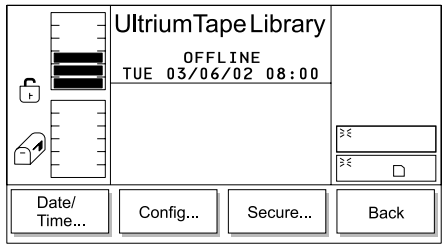
Figure 249. Utils Submenu

4. Press the button below the **Secure** softkey. The Enter Password Dialog displays (see Figure 250).
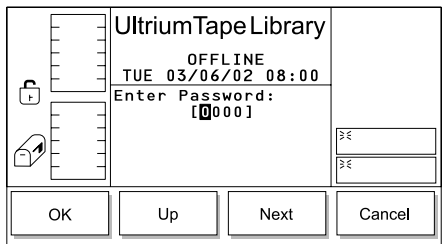
Figure 250. Enter Password Dialog

5. Enter your password by pressing the button below the **Next** softkey until the selection cursor highlights the character that you want to change. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat as necessary for each character in the password.

6. Verify that the password is correct on the display, then press the button below the **OK** softkey. The Security Enabled Dialog displays with a checkmark beside the `Enable Security` field to indicate that security is currently enabled (see Figure 251).
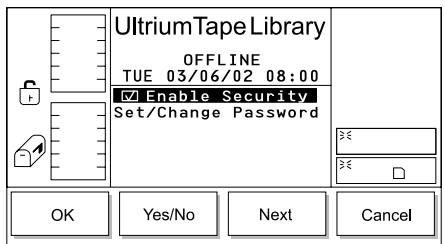
Figure 251. Security Enabled Dialog

7. Press the button below the **Yes/No** softkey until the checkmark disappears from the checkbox beside the `Enable Security` field. The Enter Password Dialog displays (see Figure 252 on page 187).
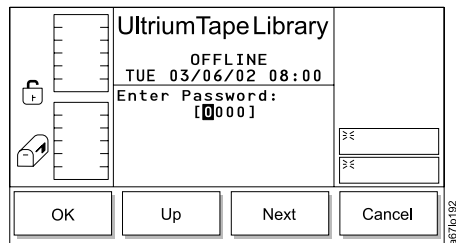
Figure 252. Enter Password Dialog

8. Enter your password by pressing the button below the **Next** softkey until the selection cursor highlights the character that you want to change. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat as necessary for each character in the password.

9. Verify that the password is correct on the display, then press the button below the **OK** softkey. The library displays the message `Security is now OFF.`

10. Press the button below the **OK** softkey to redisplay the Secure Dialog and view the new setting (see Figure 253).

Recommendation: Security is now OFF and eliminates the need for a password. If
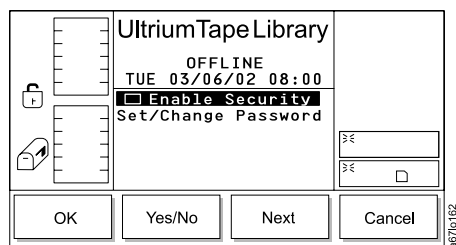
Figure 253. Secure Dialog

the password has been changed to something other than the default password [0000], it is recommended to change it back to the default password. Otherwise, if security is enabled sometime in the future, the current password will still be in effect and will have to be remembered in order to navigate through the screens or even to disable security.

11. To return to the Utils Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Entering the Control Path Failover License Key

The Ultrium Scalable Tape Library requires that you use an 8-character license key to enable the control path failover feature. To enter a license key, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Setup —> Utils —> More —> License

The License Dialog displays (see Figure 254).
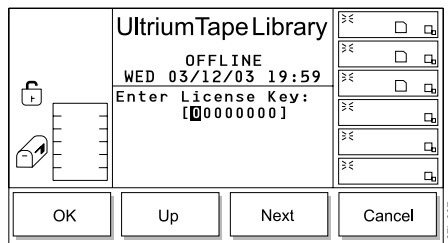
Figure 254. License Dialog

- Perform one of the following:
  - To accept all characters in the license key, press the button below the **OK** softkey.
  - To select another character, press the button below the **Next** softkey until the character that you want is highlighted. To increment that character, press the button below the **Up** softkey until 0 through 9 or A through F displays.
- To return to the Main Menu press the button below the **OK** softkey, then press the button below the **OK** and **Back** softkeys until the Main Menu displays.

Resolving Errors

If a problem occurs during operation, you can view service action codes (SACs) from which you can determine the source of the error and the action required to correct it (see "Service Action Codes" on page 297). To view the SACs, perform the following steps.

Shortcut: **Main Menu (initial screen) —> More —> Service —> Start**
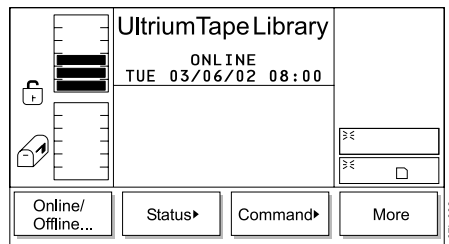

Figure 255. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 256).
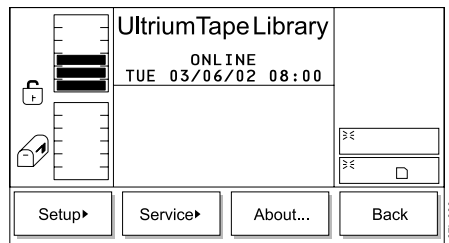

Figure 256. Main Menu (alternate screen)

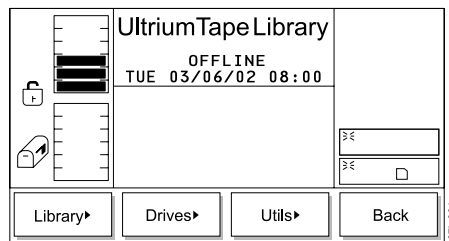2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 257 on page 190).
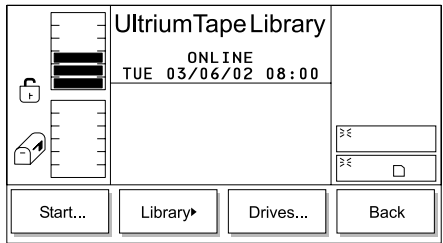
Figure 257. Service Menu

3. Press the button below the **Start** softkey. The Start Dialog displays (see Figure 258) with the NORMAL service type highlighted.
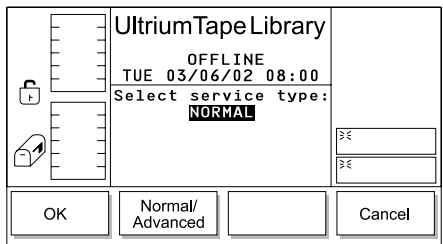
Figure 258. Start Dialog

4. Perform one of the following:
   - To view the SAC codes and resolve the error by yourself (normal service), press the button below the **OK** softkey. The Normal Service Dialog displays a list of SACs and a message when there are no more SACs to report (see Figure 259). To return to the Service Menu, press the button below the **OK** softkey.
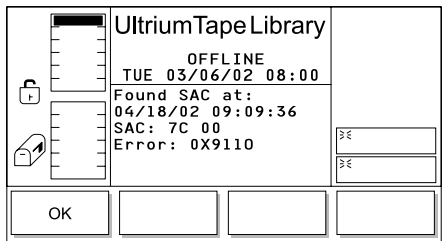
Figure 259. Normal Service Dialog

   - **Instruction for service personnel only:** To reenter the library's serial number after you have replaced the main controller board, press the button below the **Normal/Advanced** softkey. The screen refreshes and highlights the ADVANCED service type. The Enter Password Dialog displays (see Figure 260 on page 191).
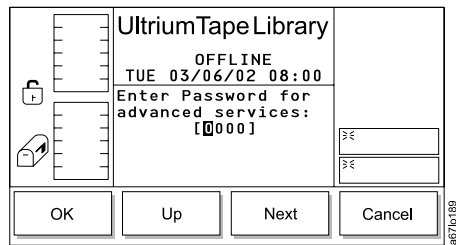
Figure 260. Enter Password Dialog

Enter the 4-character password (if you do not know the password, contact your Support Center). To enter the password, perform the following steps:

a. Press the button below the **Up** or **Down** softkey to increase or decrease the value in the highlighted field, then press the button below the **Next** softkey to accept the value and move to the next character in the password.

b. Repeat step 4a for each character in the password until the complete password displays.

c. Verify that the password is correct on the display, then press the button below the **OK** softkey to access the screen in which you can reenter the library's serial number.

d. Repeat step 4a to enter each character of the serial number until the complete serial number displays. The preferred method of entering the library serial number on a new main controller board utilizes the library serial port using the command `setser` (see the section about the main controller board in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide). Libraries with the Multi-Path feature use internal 3583 library arbitration firmware to set the serial number and eliminate the need for manual entry of the serial number that is required in machines without the Multi-Path feature.

Running Library Diagnostics

The library includes diagnostics for the sensors, the vertical and rotary axes of the picker, and the fingers on the picker. The sections that follow describe each type of diagnostic.

Checking the Sensors and Locking or Unlocking of the I/O Station Door

To view the status of library mechanisms through their sensors and to lock or unlock the I/O station door, perform the following steps.

Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Sensors

Figure 261. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 262).
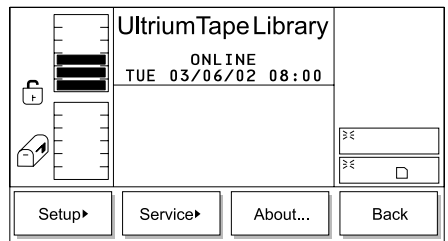

Figure 262. Main Menu (alternate screen)

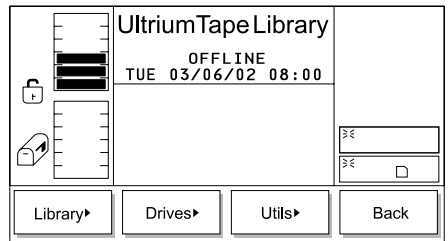2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 263 on page 193).

Figure 263. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 264).

Figure 264. Library Submenu

4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 265).


Figure 265. Diags Submenu

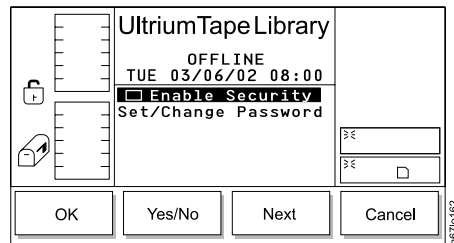5. Press the button below the **Sensors** softkey. The Sensor Dialog displays (see Figure 266).
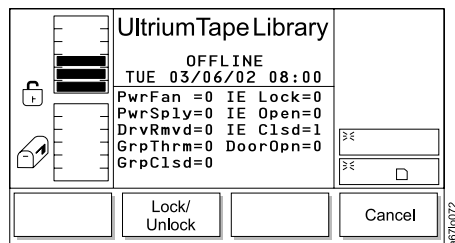
Figure 266. Sensor Dialog

The Sensor Dialog contains the following information. You can change only the IE Lock field; all other fields are for information only and cannot be changed.

PwrFan	Status of the power supply fan. 0 means not operating; 1 means operating.
PwrSply	Installation of additional power supply. 0 means not installed; 1 means installed.
Drv Rmvd	Status of the tape drive. 0 means that the drive has not been removed; 1 means that the drive has been removed.
GrpThrm	Installation of picker's thermometer. 0 means not installed; 1 means installed.
GrpClsd	Status of the picker. 0 means open; 1 means closed.
IE Lock	Status of the lock on the I/O station door. 0 means unlocked; 1 means locked. You can also determine the status by examining the padlock icon in the I/O station status area. If the door of the I/O station is locked, the arm of the icon is down; if the door of the I/O station is unlocked, the arm of the icon is up.
IE Open	Status of the I/O station door. 0 means closed; 1 means open.
IE Clsd	Status of the I/O station door. 0 means open; 1 means closed.
DoorOpn	Status of the front door. 0 means closed; 1 means open.

6. To lock or unlock the I/O station door, press the button below the **Lock/Unlock** softkey until 0 (unlocked) or 1 (locked) displays in the IE Lock field.

7. To return to the Diags Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Picker's Get and Put Capability

To check the ability of the picker to get and put tape cartridges into storage slots or drives, perform the following steps.

Note: Get/Put diagnostic does not return the cartridges to their original location.
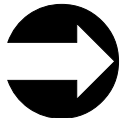
Shortcut: **Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Fingers —> Get/Put**
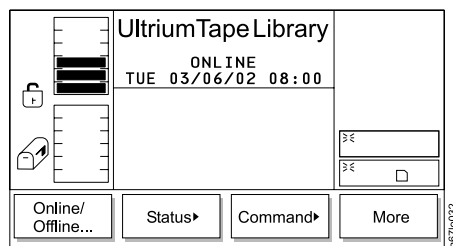

Figure 267. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 268 on page 195).
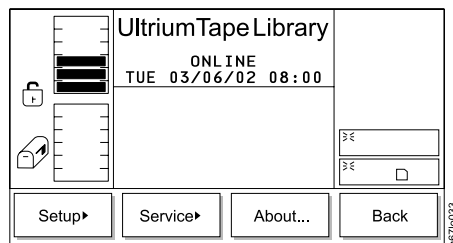
Figure 268. Main Menu (alternate screen)

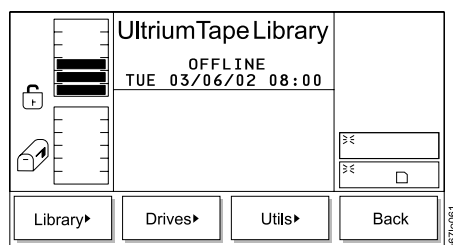2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 269).

Figure 269. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 270).

Figure 270. Library Submenu

4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 271).

Figure 271. Diags Submenu

5. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 272).
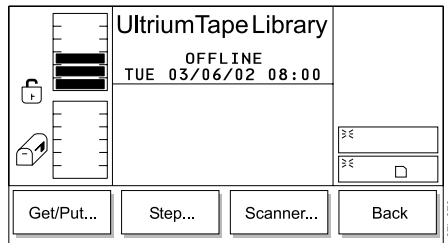
Figure 272. Fingers Submenu

6. Press the button below the **Get/Put** softkey. The Get/Put Dialog displays (see Figure 273).
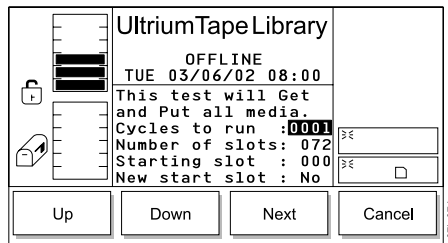
Figure 273. Get/Put Dialog

The Get/Put Dialog contains the following information:

Cycles to run   Specifies the number of cycles to run. Valid values are 0 through 9999.

Number of slots   Specifies the number of slots to use during the cycles. Valid values are 0 through 72.

Starting slot   Indicates the slot location from which the Get/Put diagnostic will begin. This a read-only field that you can only change after you specify `Yes` in the `New start slot` field (see the description of the next field).

New start slot   Specifies the new slot location from which the Get/Put diagnostic will begin. Valid values are Yes (change the start slot) or No (use this installed).

7. Perform one or more of the following:
    *   To change the value in the `Cycles to run` field, press the button below the **Up** or **Down** softkeys until the value that you want displays.
    *   To change the value in the `Number of slots` field, press the button below the **Next** softkey until the selection cursor highlights that field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
    *   To change the value in the `Starting slot` field, perform the following steps:
        a. Press the button below the **Next** softkey until the selection cursor highlights the `New start slot` field. The New Start Slot Dialog displays (see Figure 274 on page 197).
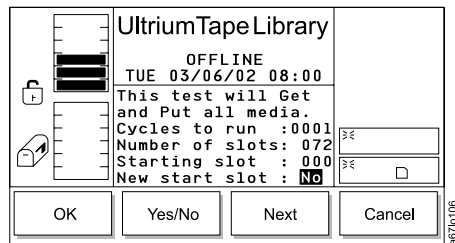
Figure 274. New Start Slot Dialog

   b. Press the button below the **Yes/No** softkey until `Yes` displays.

   c. Press the button below the **OK** softkey. The Get/Put Source Dialog displays (see Figure 275) with a message area that shows three icons:
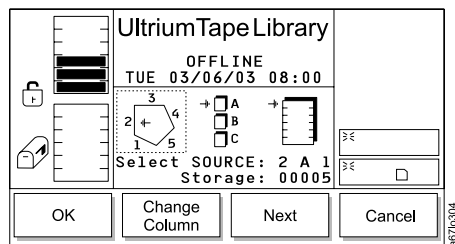
Figure 275. Get/Put Source Dialog

   – The left icon represents the columns in the library, with an arrow pointed to the column that is currently selected.

   – The middle icon represents the magazines in the currently selected column. The arrow points to the currently selected magazine.

   – The right icon represents the storage slots in the currently selected column and magazine. The arrow points to the currently selected storage slot.

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of `2 A 1`. In the Get/Put Source Dialog, a slot's physical address displays below the right icon (see Figure 275).

• Specify the new location from which you want the Get/Put diagnostic to start by performing one of the following:

   – To specify the physical address that is currently displayed, press the button below the **OK** softkey.

   – To specify another location, perform the following steps:

      a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 276 on page 198).

      Note: If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the

Change Column softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.
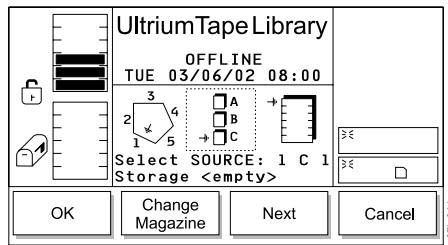
Figure 276. Change Magazine Dialog

b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 277).
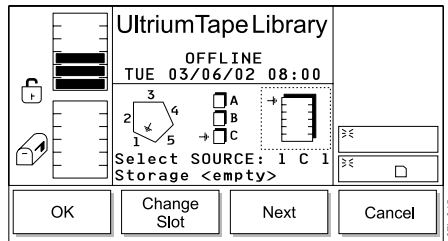
Figure 277. Change Slot Dialog

c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.

d. Perform one of the following:

   - To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.

   - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

8. Press the button below the **OK** softkey. The Get/Put Execution screen displays with a `Status` field that indicates the diagnostic is `Running` (see Figure 278. When the test completes, the screen refreshes and the `Status` field displays `Completed`.

Figure 278. Get/Put Execution screen

9. To return to the Fingers Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Picker's Open, Close, Reach, and Retract Capabilities

To check the ability of the picker to open, close, reach, and retract its fingers, perform the following steps.

Note: This is an advanced diagnostic that is not intended for use during normal operation.

Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Fingers —> Step
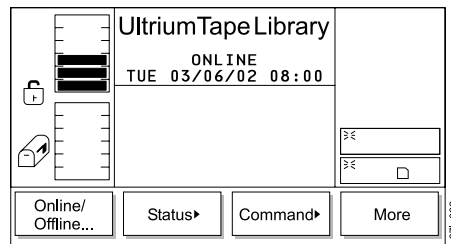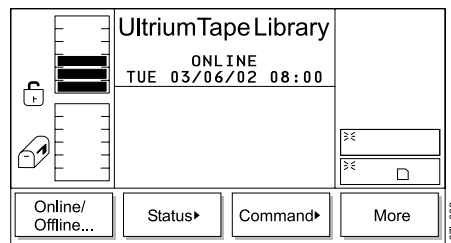

Figure 279. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 280).
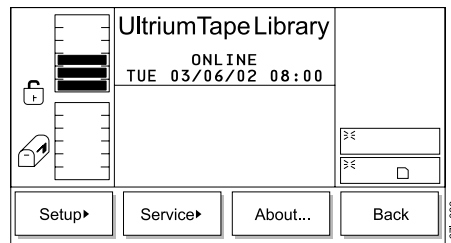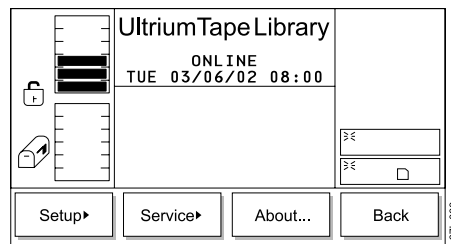

Figure 280. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 281).
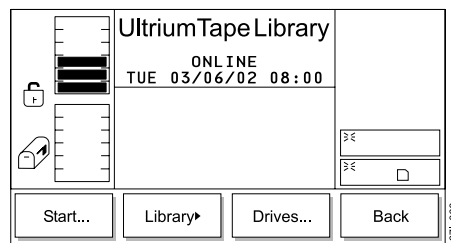
Figure 281. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 282).
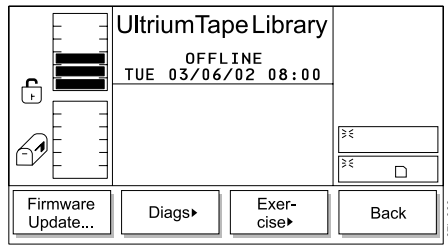
Figure 282. Library Submenu

4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 283).
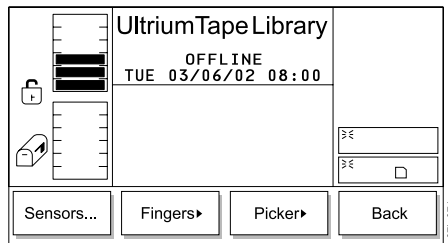
Figure 283. Diags Submenu

5. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 284).
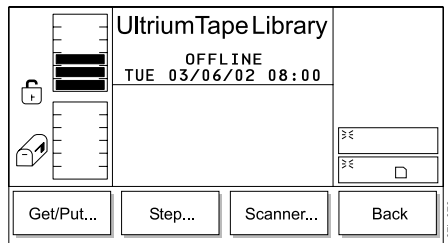
Figure 284. Fingers Submenu

6. Press the button below the **Step** softkey. The Step Dialog displays a reminder that this diagnostic should be used by trained personnel only (see Figure 285).
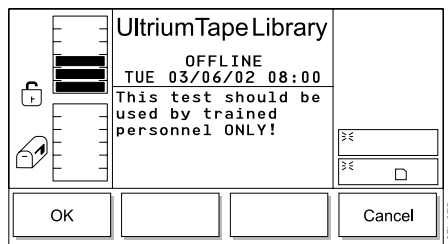
Figure 285. Step Dialog

7. Press the button below the **OK** softkey. The Picker Finger Dialog displays (see Figure 286).
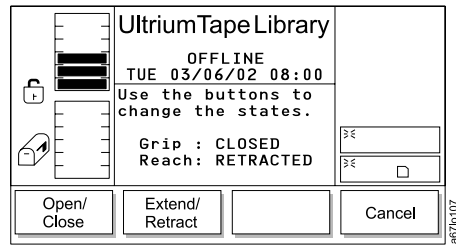
Figure 286. Picker Finger Dialog

The Picker Finger Dialog contains the following information:

Grip   Indicates whether the picker's fingers are open or closed. Valid values are OPEN or CLOSED.

Reach   Indicates whether the picker's fingers are extended or retracted. Valid values are EXTENDED or RETRACTED.

8. Perform one or more of the following:

   • To open or close the picker's fingers, press the button below the **Open/Close** softkey until the value that you want displays in the `Grip` field.

   • To extend or retract the picker's fingers, press the button below the **Extend/Retract** softkey until the value that you want displays in the `Reach` field.

9. To return to the Fingers Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Functionality of the Bar Code Reader

To check the ability of the bar code reader to read the bar code labels on the tape cartridges, perform the following steps.

Note: Before beginning this procedure, choose an occupied slot as a point of reference and position the picker in front of that slot (see "Moving the Picker" on page 130). Make a note of the cartridge's VOLSER.

<u>**Shortcut:**</u> **Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Fingers —> Scanner**
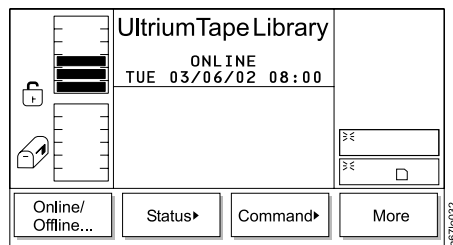
Figure 287. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 288).

Figure 288. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 289).
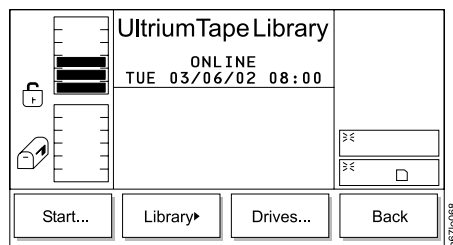
Figure 289. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 290 on page 203).
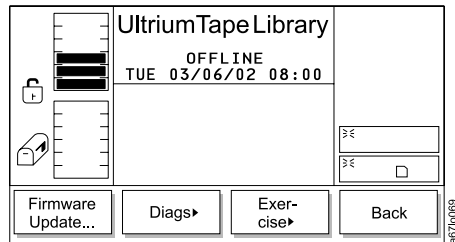
Figure 290. Library Submenu

4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 291).
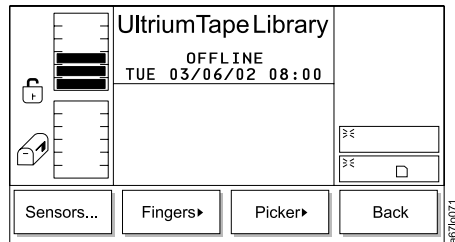
Figure 291. Diags Submenu

5. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 292).
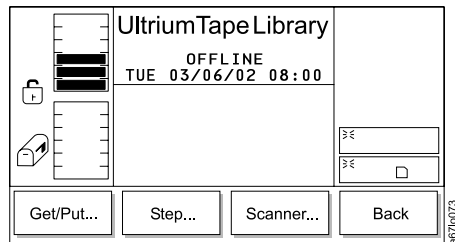
Figure 292. Fingers Submenu

6. Press the button below the **Scanner** softkey. The Reader Dialog displays (see Figure 293).
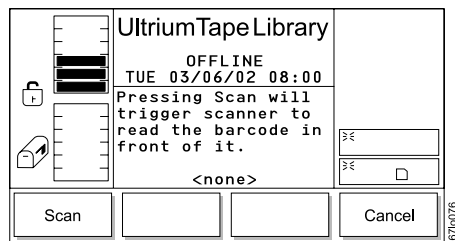
Figure 293. Reader Dialog

7. Press the button below the **Scan** softkey. The bar code reader scans the cartridge that is currently in front of it. The Bar Code Label Dialog displays the

cartridge's VOLSER (see Figure 294). Ensure that the VOLSER on the operator panel matches the VOLSER on the cartridge.
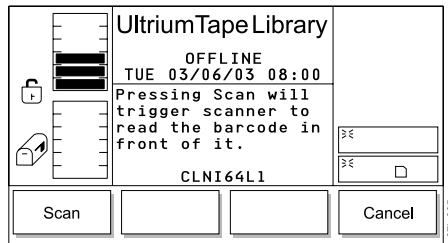
Figure 294. Bar Code Label Dialog

8. To return to the Fingers Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Movement of the Picker

The Picker diagnostic checks the ability of the picker to move its vertical and rotary axes in motion patterns and in incremental steps. It also tests the picker's ability to locate to the home position. The sections that follow describe each procedure.

Checking the Picker's Motion Patterns
To check the ability of the picker to move the vertical and rotary axes in motion patterns, perform the following steps.

Shortcut: **Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Picker —> Move**
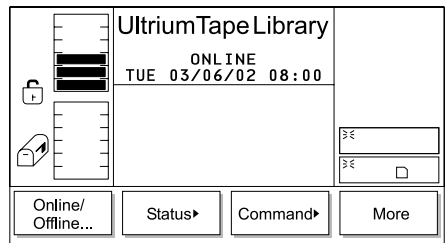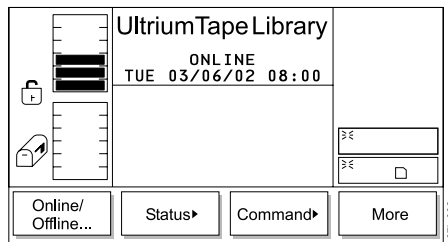

Figure 295. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 296 on page 205).
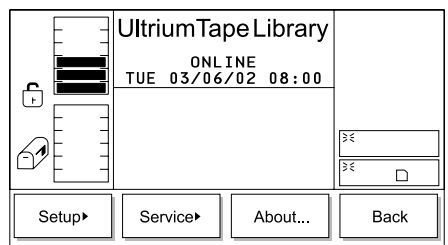
Figure 296. Main Menu (alternate screen)

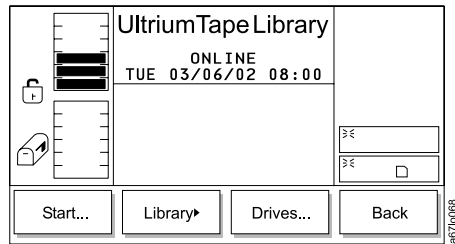2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 297).

Figure 297. Service Menu

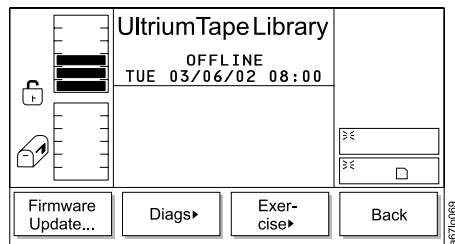3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 298).
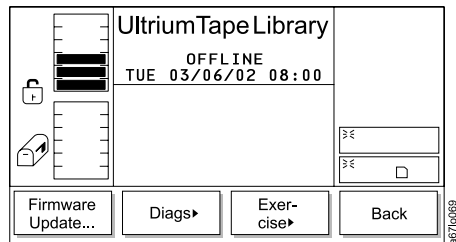
Figure 298. Library Submenu

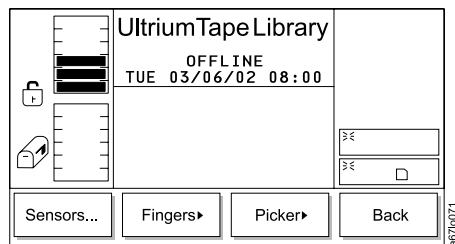4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 299).
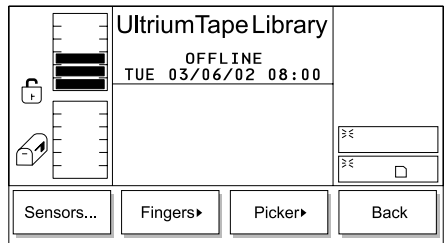
Figure 299. Diags Submenu

5. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 300).
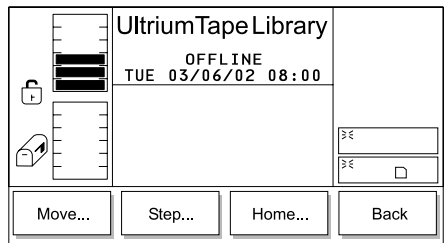
Figure 300. Picker Submenu

6. Press the button below the **Move** softkey. The Move Dialog displays (see Figure 301).
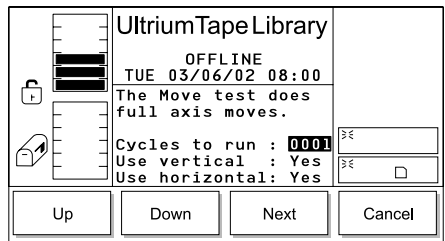
Figure 301. Move Dialog

The Move Dialog contains the following information:

Cycles to run   Specifies the number of move cycles. Valid values are 0 through 9999.

Use vertical   Specifies whether to move the picker on the vertical axis. Valid values are Yes (move on the vertical axis) or No (do not move on the vertical axis).

Use horizontal   Specifies whether to move the picker on the horizontal axis. Valid values are Yes (move on the horizontal axis) or No (do not move on the horizontal axis).

7. Perform one or more of the following:
   - To change the number of cycles to run, press the button below the **Up** or **Down** softkeys until the value that you want displays in the `Cycles to run` field.
   - To specify whether to test the vertical or horizontal axis, press the button below the **Next** softkey until the selection cursor highlights the value in the `Use vertical` or `Use horizontal` field. The Use Axis Dialog displays (see Figure 302). Press the button below the **Yes/No** softkey until the value that you want displays.
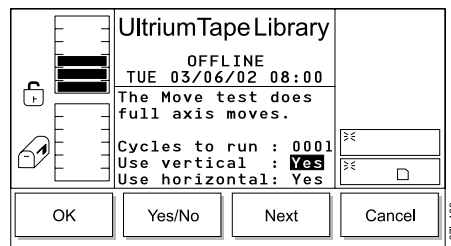
Figure 302. Use Axes Dialog

8. Press the button below the **OK** softkey to perform the diagnostic. The Move Test Execution screen displays (see Figure 278 on page 198) with a summary of the test settings and a `Status` field that indicates that the diagnostic is `Running`. When the test completes, the screen refreshes and the `Status` field displays `Completed`.
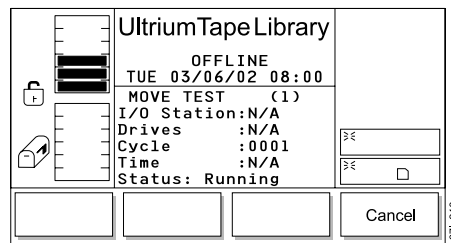
Figure 303. Move Test Execution screen

9. To return to the Picker Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Picker's Step Capability

To check the ability of the picker to move vertically and to rotate in incremental steps, perform the following instructions.

Note: This is an advanced diagnostic tool that is not intended for use during normal operation.

Shortcut: <u>**Main Menu (initial screen)**</u> —> **More** —> **Service** —> **Library** —> **Diags** —> **Picker** —> **Step**
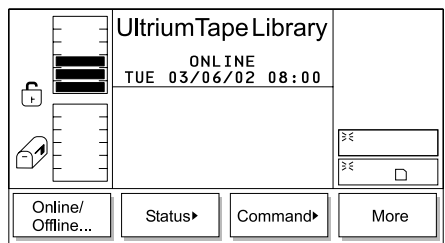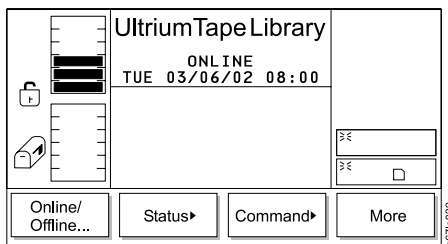

Figure 304. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 305).
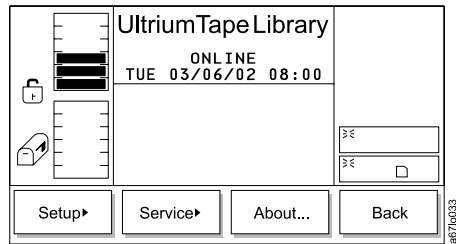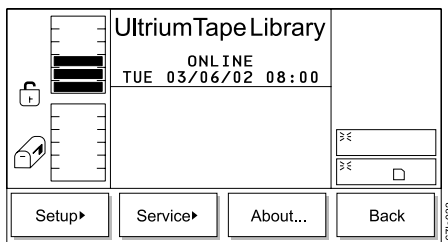

Figure 305. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 306).

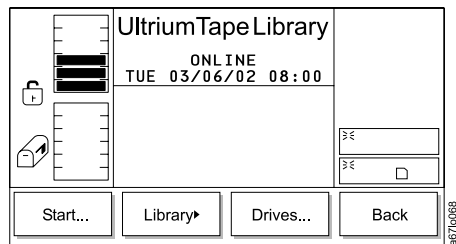

Figure 306. Service Menu

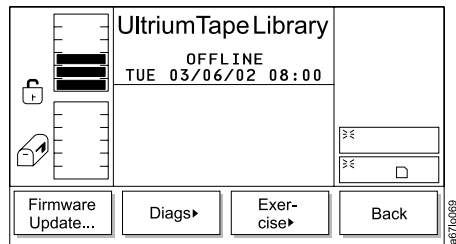3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 307 on page 209).
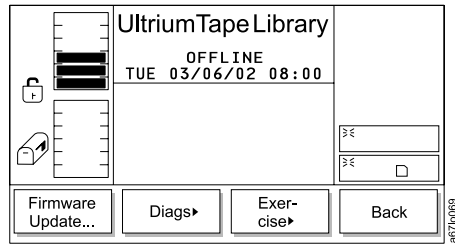
Figure 307. Library Submenu

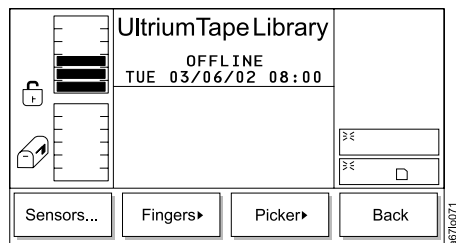4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 308).
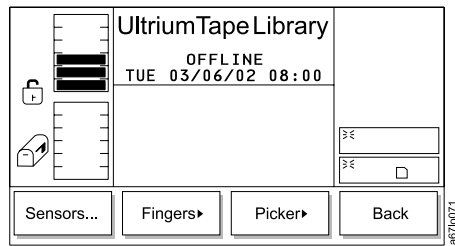
Figure 308. Diags Submenu

5. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 309).
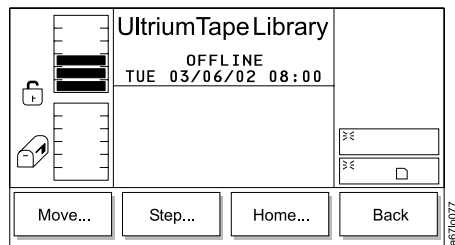

Figure 309. Picker Submenu

6. Press the button below the **Step** softkey. The Step Dialog displays a reminder that this diagnostic should be used by trained personnel only (see Figure 310 on page 210).
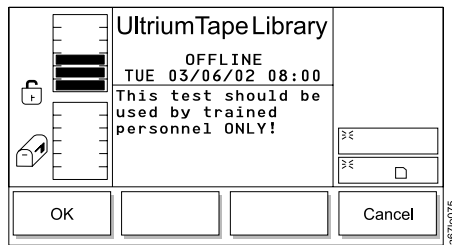
Figure 310. Step Dialog

7. Press the button below the **OK** softkey. The Axes Dialog displays (see Figure 311).
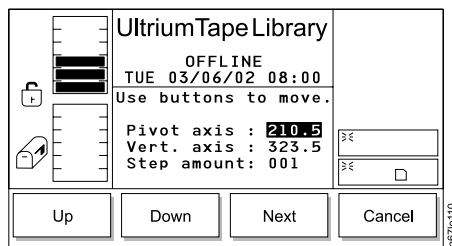
Figure 311. Axes Dialog

The Axes Dialog contains the following information:

Pivot axis   Indicates the degrees of the rotary position. Valid values are 000.0 through 360.0.

Vert. axis   Indicates the height of the picker in millimeters. Valid values are 000.0 through the maximum range.

Step amount   Indicates tenths of millimeters to step. Valid values are 001 through 100.

8. Perform one or more of the following:

   • To change the degrees of the rotary position, press the button below the **Up** or **Down** softkeys until the value that you want displays in the `Pivot axis` field.

   • To change the height of the picker, press the button below the **Next** softkey until the selection cursor highlights the value in the `Vert. axis` field. Then, press the button below the **Up** or **Down** softkeys until the value that you want displays.

   • To change the amount of the step, press the button below the **Next** softkey until the selection cursor highlights the value in the `Step amount` field. Then, press the button below the **Up** or **Down** softkeys until the value that you want displays.

9. To accept the changes and return to the Picker Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Picker's Homing Capability

To check the ability of the picker to locate the vertical and rotary axes to the home position, perform the following steps.
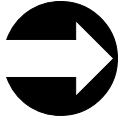
Shortcut: <u>Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Picker —> Home</u>

Figure 312. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 313).

Figure 313. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 314).
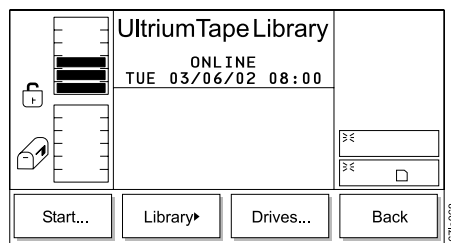
Figure 314. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 315).
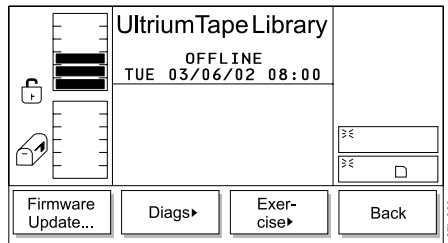
Figure 315. Library Submenu

4. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 316).
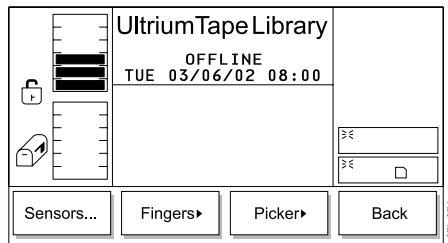
Figure 316. Diags Submenu

5. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 317).
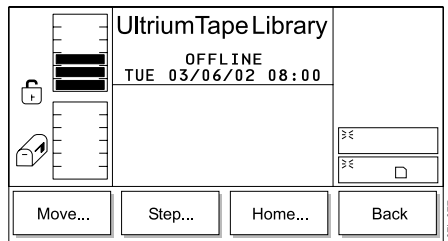
Figure 317. Picker Submenu

6. Press the button below the **Home** softkey. The Home Dialog displays (see Figure 318 on page 213) with a message stating that the picker will relocate to its zero position on all axes.
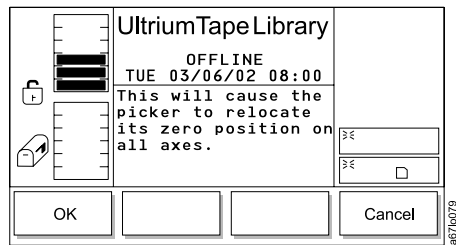
Figure 318. Home Dialog

7. Press the button below the **OK** softkey. The picker returns to the home position and the library displays the message `Requested command is now complete.`

8. To return to the Picker Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Exercising the Library

The library's exercises include a demonstration, a self test, and a calibration procedure known as Teach. The sections that follow describe each exercise.

Performing a Demonstration of the Library

The library's demonstration (demo) illustrates random cartridge movement in the library. The minimum number of cartridges recommended for this routine is two per drive, plus one additional cartridge. To perform a demo of the library, use the following steps.

Note: This operation does not return the cartridges to their original location.

Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Exercise —> Demo

Figure 319. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 320).
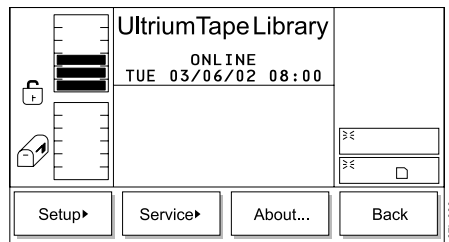
Figure 320. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 321 on page 215).
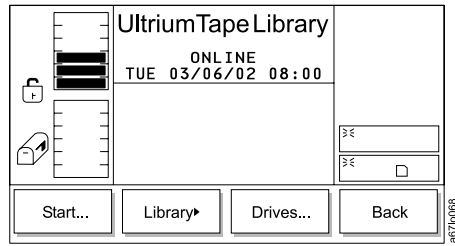
Figure 321. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 322).
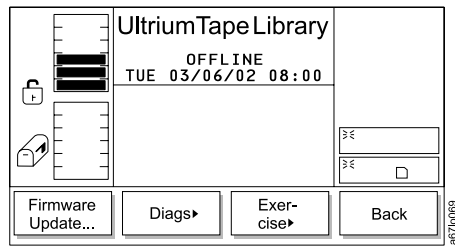
Figure 322. Library Submenu

4. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 323).
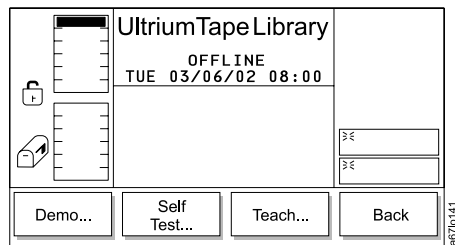
Figure 323. Exercise Submenu

5. Press the button below the **Demo** softkey. The Demo Dialog displays (see Figure 324).
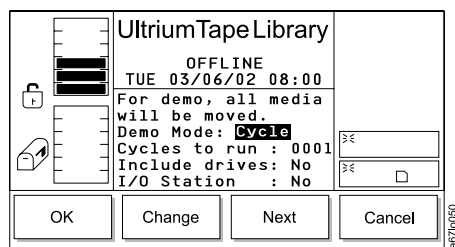
Figure 324. Demo Dialog

The Demo Dialog contains the following information:

Demo Mode Indicates whether to run the demo based on a quantity of cycles or hours. Valid values are Cycle and Time.

Cycles to run Specifies the number of cycles to run during the demo. This field displays only if you chose Demo Mode: Cycle. Valid values are 0 through 9999.

Hours to run Specifies the number of hours to run the demo. This field displays only if you chose Demo Mode: Time. Valid values are 2 through 24.

Include drives Specifies whether to include drives in the demo. Valid values are Yes (include drives in the demo) or No (do not include drives in the demo).

I/O Station Specifies whether to include the I/O station in the demo. Valid values are Yes (include the I/O station in the demo) or No (do not include the I/O station in the demo).

6. Perform one of the following:
   - To accept the current settings, go to step 8 on page 217.
   - To change the value in one or more fields, press the button below the **Next** softkey until the selection cursor highlights the value in that field. Perform one of the following:
     – To change the mode of the demo (cycles or hours), press the button below the **Up** or **Down** softkeys until the value that you want displays in the `Demo Mode` field.
     – To change the number of cycles or hours to run the demo, press the button below the **Next** softkey until the selection cursor highlights the value in the `Cycles to run` or `Hours to run` field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
     – To include drives or the I/O station in the demo, press the button below the **Next** softkey until the selection cursor highlights the value in the `Include drives` or `I/O Station` field. The screen automatically refreshes and displays a **Yes/No** softkey (see Figure 325). Press the button below the **Yes/No** softkey until the value that you want displays.
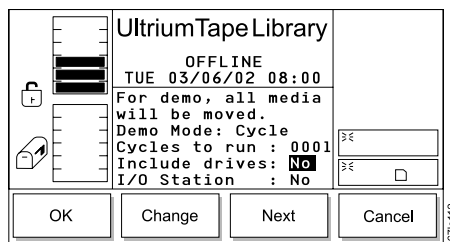
Figure 325. Include Drives Dialog

7. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to begin the demo. The Demo Execution screen displays (see Figure 326) with a summary of the test settings and a `Status` field that indicates that the diagnostic is `Running`. When the test completes, the screen refreshes and the `Status` field displays `Completed`.

```
UltriumTapeLibrary
         OFFLINE
   TUE 03/06/02 08:00
   DEMO          (1)
  I/O Station:No
  Drives      :No
  Cycle       :0001
  Time        :00h00m
  Status: Running

                        Cancel
```
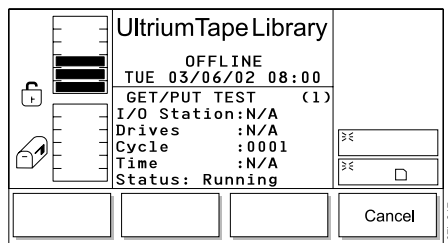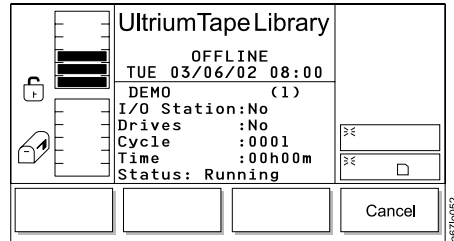
Figure 326. Demo Execution screen

8. To return to the Exercise Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Performing a Self Test of the Library

The library's self test runs a series of diagnostics to test its sensors, the lock and unlock function of its door, and the movement of all motors. When the library contains drives, the routine also sends communication messages to the drive sleds. No cartridges are moved during the self test. To perform a self test of the library, use the following steps.

Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Exercise —> Self Test
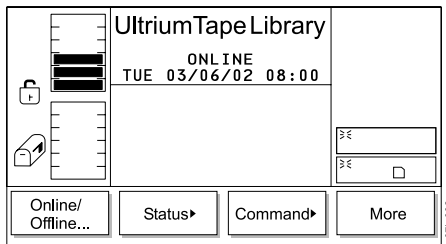
Figure 327. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 328).
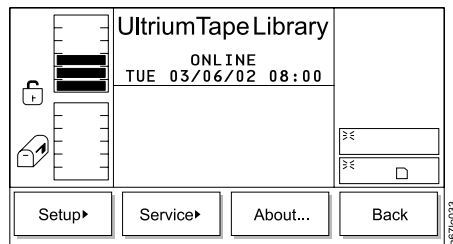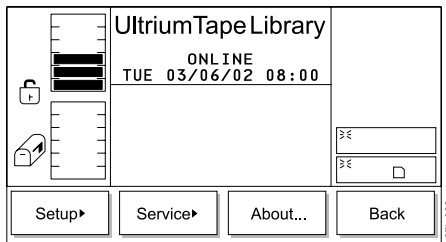
Figure 328. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 329).
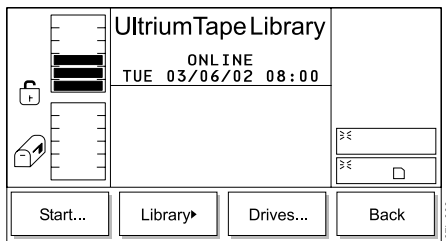
Figure 329. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 330 on page 219).
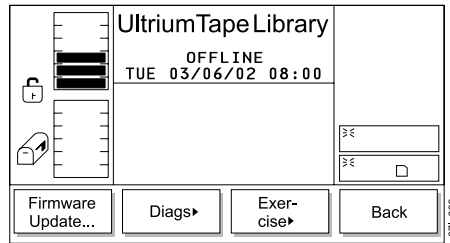
Figure 330. Library Submenu

4. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 331).
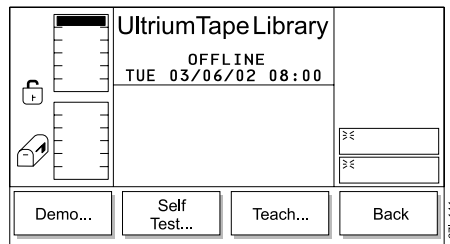
Figure 331. Exercise Submenu

5. Press the button below the **Self Test** softkey. The Self Test Dialog displays (see Figure 332).
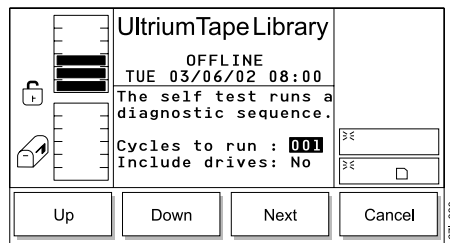
Figure 332. Self Test Dialog

The Self Test Dialog contains the following information:

Cycles to run   Indicates the number of test cycles to run. Valid values are 0 through 999.

Include drives   Specifies whether to include drives in the demo. Valid values are Yes (include drives in the self test) or No (do not include drives in the self test).

6. Perform one of the following:

- To accept the number of cycles to run, press the button below the **Next** softkey to advance the selection cursor to the next field.

- To change the number of cycles to run during the self test, press the button below the **Up** or **Down** softkeys until the value that you want displays. Press the button below the **Next** softkey to advance the selection cursor to the next field.

7. To include or exclude drives in the self test, press the button below the **Next** softkey until the selection cursor highlights the `Include drives` field. The screen refreshes and the Include Drives Dialog displays (see Figure 333). Press the button below the **Yes/No** softkey until Yes (include drives) or No (exclude drives) displays.
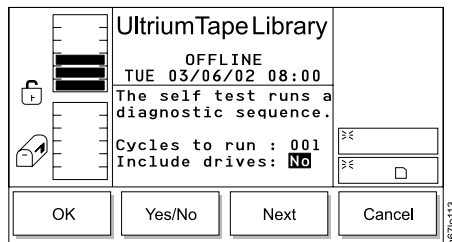
Figure 333. Include Drives Dialog

8. Press the button below the **OK** softkey to perform the self test. The Self Test Execution Dialog displays a summary of the test settings and a `Status` field that indicates that the diagnostic is `Running`. When the test completes, the screen refreshes and the `Status` field displays `Completed` (see Figure 334).
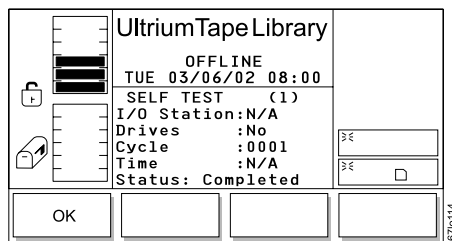
Figure 334. Self Test Execution Dialog

9. To return to the Exercise Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.
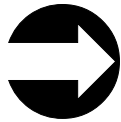
Calibrating the Library

To calibrate the proper position of the gripper in the library, perform the following steps. The calibration procedure is also known as Teach.

Shortcut: **Main Menu (initial screen) —> More —> Service —> Library —> Exercise —> Teach**

Figure 335. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 336).
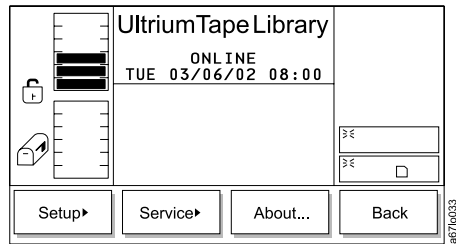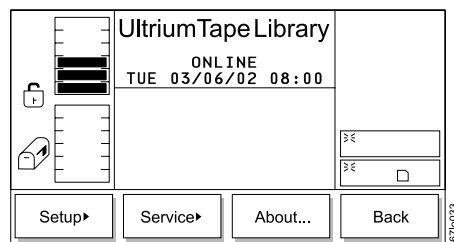

Figure 336. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 337).
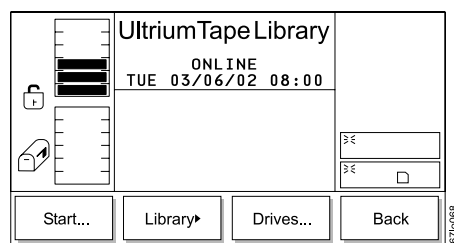
Figure 337. Service Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 338 on page 222).
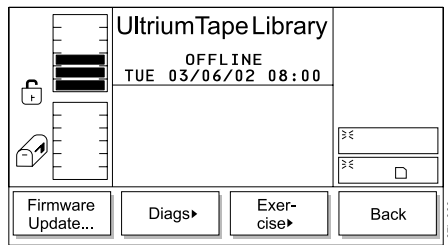
Figure 338. Library Submenu

4. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 339).
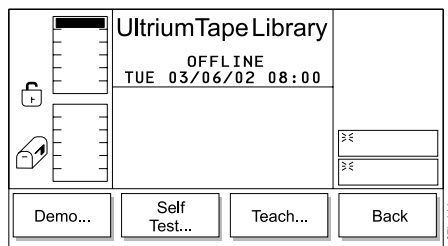
Figure 339. Exercise Submenu

5. Press the button below the **Teach** softkey. The library displays the message `Select OK to Teach.`

6. Press the button below the **OK** softkey to begin the calibration. When the calibration is finished, the library displays the message `The requested Teach completed OK.`

7. To return to the Exercise Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Running Drive Diagnostics

Attention: Insert only a scratch data cartridge for this procedure. Data on the cartridge will be overwritten.

The drive diagnostics test the drive's normal and fast read/write capability, as well as the function of its media, head, electrical power, and SCSI circuitry. The sections that follow describe each type of diagnostic.

To select a drive and run a diagnostic on it, perform the following steps:

Shortcut: Main Menu (initial screen) —> More —> Service —> Drives —> OK or **Change Drive—> Diags**
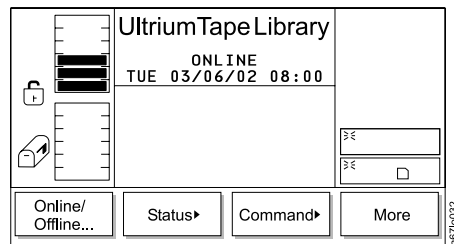
Figure 340. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 341).
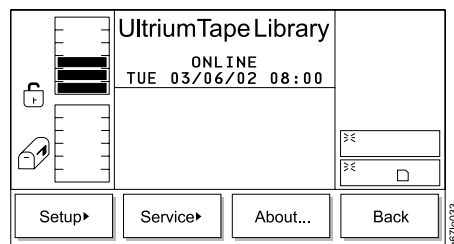
Figure 341. Main Menu (alternate screen)

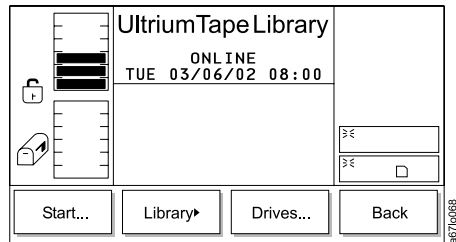2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 342).
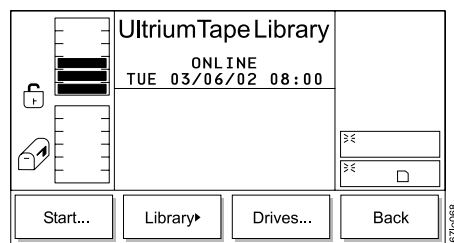
Figure 342. Service Menu

3. Press the button below the **Drives** softkey. The Drives Dialog displays the number of a drive in the library and its current level of firmware (see Figure 343).
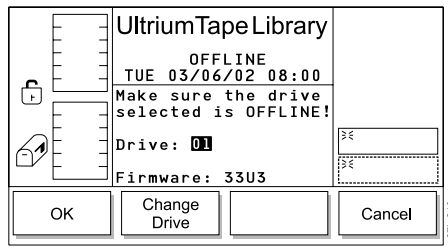
Figure 343. Drives Dialog

4. Perform one of the following:
   - To run the diagnostic on the currently displayed drive, press the button below the **OK** softkey.
   - To run the diagnostic on a different drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays. Press the button below the **OK** softkey.

   The Drive Service Dialog displays (see Figure 344).
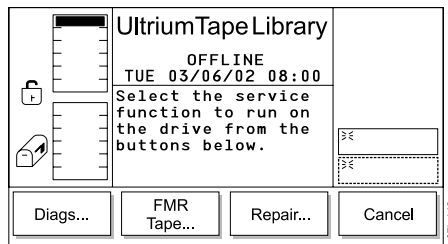
Figure 344. Drive Service Dialog

5. Press the button below the **Diags** softkey. The Drive Diagnostics Dialog displays the first of the six diagnostics that you can run on the specified drive (see Figure 345 on page 225). Each diagnostic is presented one at a time.
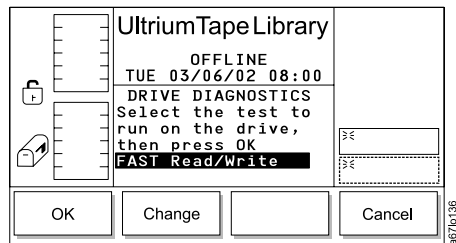
Figure 345. Drive Diagnostics Dialog

The Drive Diagnostics Dialog contains the following supported tests:

FAST Read/Write   Performs a load and unload operation, and a read and write test.

NORMAL Read/Write   Performs a load and unload operation, a read and write test, and other related tests. The NORMAL Read/Write test is more comprehensive and longer in duration than the FAST Read/Write test.

Media Read/Write   Tests whether a suspect tape cartridge and its magnetic tape are acceptable.

Head Read/Write   Tests whether a suspect tape cartridge and its magnetic tape are acceptable.

Power On Self Test   Tests the drive's initialization process.

SCSI Wrap Test   Tests the SCSI circuitry.

6. Perform one of the following:
   - To accept and run the currently displayed drive diagnostic, press the button below the **OK** softkey.
   - To specify and run a different drive diagnostic, press the button below the **Change** softkey until the diagnostic that you want displays. Press the button below the **OK** softkey.
7. Perform one of the following:
   - For the FAST Read/Write, NORMAL Read/Write, Media Read/Write, and Head Read/Write diagnostic, open the door of the I/O station and insert a scratch tape into the top slot. Close the door of the I/O station and press the button below the **OK** softkey.
   - For the Power On Self Test, press the button below the **OK** softkey.
   - For the SCSI Wrap Test connect the SCSI wrap tool to one SCSI port of the drive and a terminator to the other SCSI port of the drive, and press the button below the **OK** softkey.

   The library begins the diagnostic. When the test is complete, the library displays the message `Requested command is now complete.`
8. To return to the Drive Diagnostics Dialog, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Cancel** and **Back** softkeys until the Main Menu displays.

Creating or Erasing an FMR Tape

Before you can create a field microcode replacement (FMR) tape, you must have previously obtained the new firmware file by downloading it from the web, ordering it on a CD or diskette, or copying it from a drive that is already loaded with the new firmware.

To download the new firmware file from the web, visit `http://www.ibm.com/storage/lto` and select **Technical Support**.

To order the new firmware file on a CD or diskette, contact your IBM Service Representative.

To copy an FMR tape from a drive that is already loaded with the new firmware, refer to the steps in this procedure.
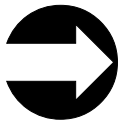
Shortcut: Main Menu (initial screen) —> More —> Service —> Drives —> OK —> FMR Tape
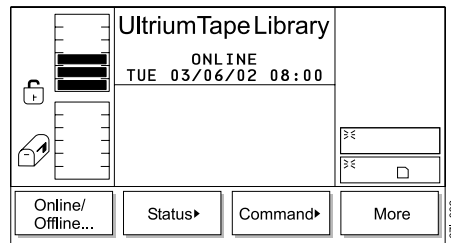
Figure 346. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 347).
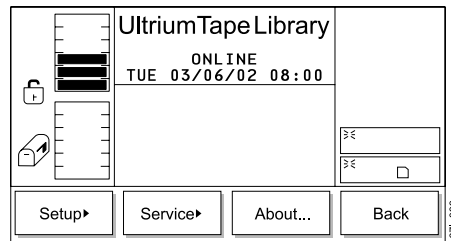
Figure 347. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 348 on page 228).
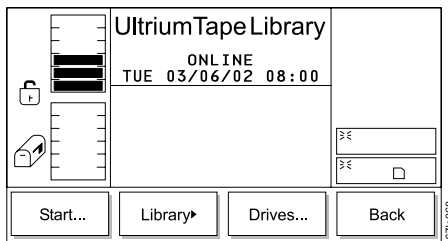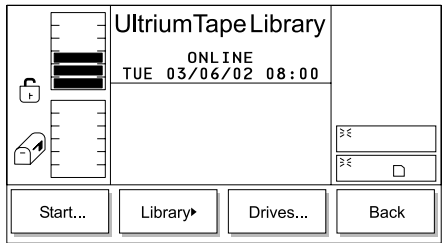
Figure 348. Service Menu

3. Press the button below the **Drives** softkey. The Drives Dialog displays the message `Make sure the drive selected is OFFLINE!` and the number of a drive in the library (see Figure 349). Ensure that the drive has completed all operations and that no backup applications are running. Within the drive column, drives are numbered 01 through 06 from bottom to top.
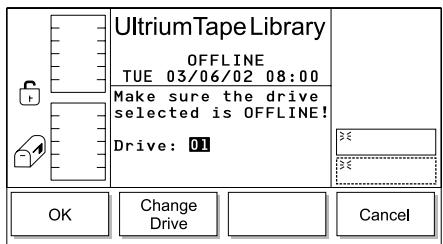
Figure 349. Drives Dialog

4. Perform one of the following:
   - To accept the current drive, press the button below the **OK** softkey.
   - To specify a different drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays. Press the button below the **OK** softkey.

   The Drive Service Dialog displays (see Figure 350).
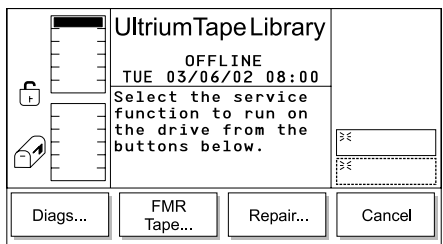
Figure 350. Drive Service Dialog

5. Press the button below the **FMR Tape** softkey. The FMR Tape Dialog displays (see Figure 351 on page 229) with the Create or Erase function highlighted.
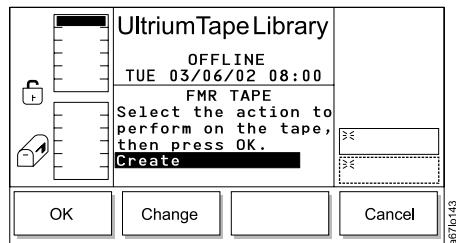
Figure 351. FMR Tape Dialog

6. Perform one of the following:
   - To accept the currently displayed function (Create or Erase), press the button below the **OK** softkey.
   - To specify another function, press the button below the **Change** softkey until the function that you want displays. Press the button below the **OK** softkey.

   The Scratch Tape Dialog displays (see Figure 352).
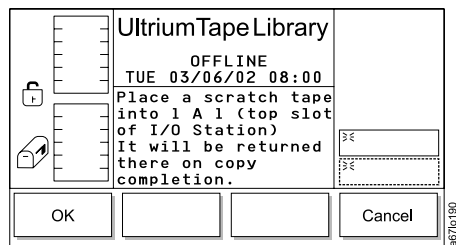
Figure 352. Scratch Tape Dialog

7. Open the door of the I/O station and insert a scratch tape into the top slot. Close the door of the I/O station and press the button below the **OK** softkey. The library creates or erases the FMR tape, displays status messages, and returns the newly created FMR tape to its original slot. When the task is complete, the library displays the message `Requested command is now complete.`

8. To return to the Scratch Tape Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey. Then press the button below the **Cancel** softkey until the Main Menu displays (or press the button below the **Change** softkey to erase the FMR tape).

Viewing the Library's Serial Number and Firmware Level

To display the library's serial number, firmware version, and application and boot code for the picker, drive sleds, main board, and display, perform the following steps:

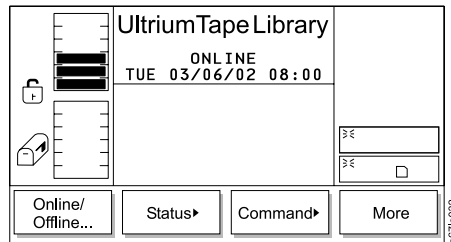**Shortcut:** <u>Main Menu (initial screen) —> More —> About —> Details—> OK</u>
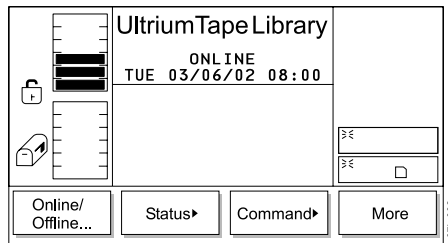
Figure 353. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 354).
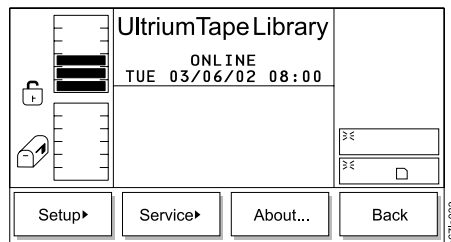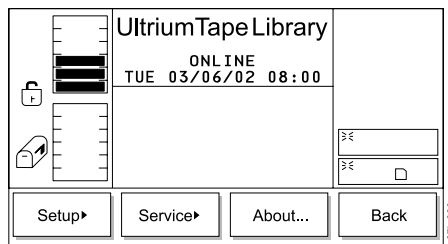

Figure 354. Main Menu (alternate screen)

2. Press the button below the **About** softkey. The About Menu displays the library's serial number and current version of firmware (see Figure 355).
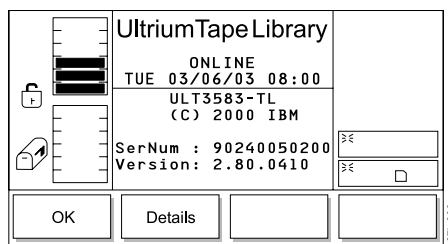
Figure 355. About Menu

3. To view the library's current application and boot code for the picker, drive sleds, main board, and display, press the button below the **Details** softkey. The Detail Dialog displays (see Figure 356 on page 231). Continue to press the button below the **Details** softkey until all details have displayed.

Note: All code levels must be the same. However, if the boot code is at 02.01.0001 or above, it does not have to have to match the other code levels.
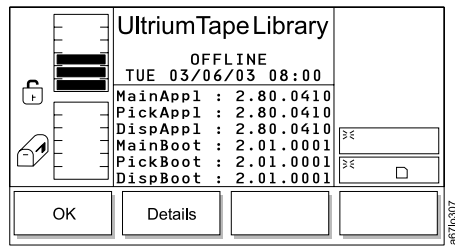
Figure 356. Detail Dialog

4. To return to the Main Menu (alternate screen), press the button below the **OK** softkey. To return to the Main Menu (initial screen) press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Setting the Length of the Media's VOLSER

You can extend the length of the volume serial number (VOLSER) on your cartridge's bar code label. To set the length, perform the following steps.

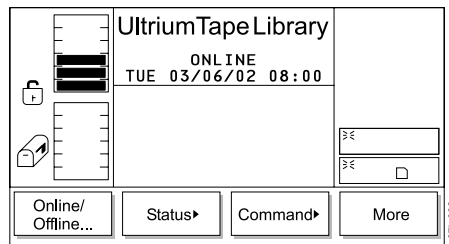**Shortcut: Main Menu (initial screen) —> More —> Setup —> Library —> MEDIA**
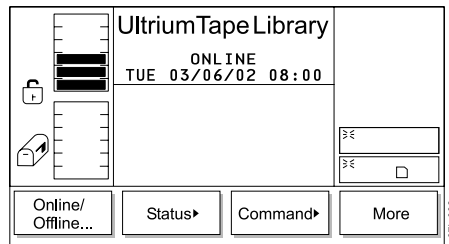
Figure 357. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 358).
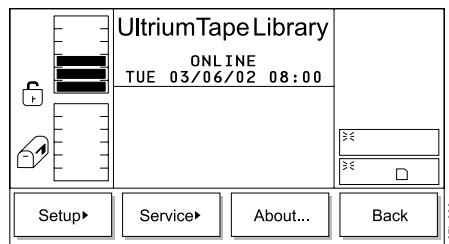
Figure 358. Main Menu (alternate screen)

2. Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 359).
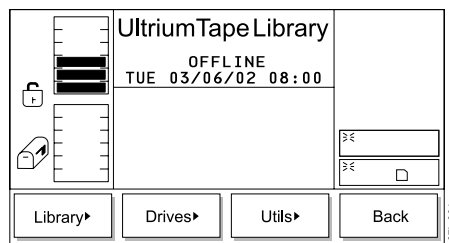
Figure 359. Setup Menu

3. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 360).
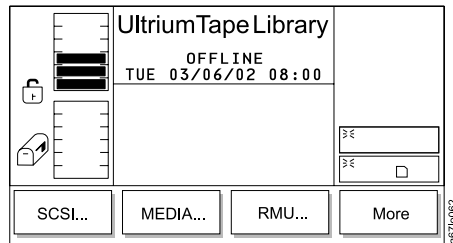
Figure 360. Library Submenu

4. Press the button below the **MEDIA** softkey. The Media Dialog displays the Volser field (see Figure 361). Available settings are:

DEFAULT   A bar code label of up to 6 characters.

EXTENDED   A bar code label of between 5 and 16 characters.
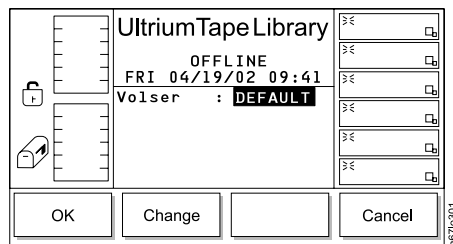
Figure 361. Media Dialog

5. Press the button below the **Change** softkey so that the Volser field changes to EXTENDED (see Figure 362).
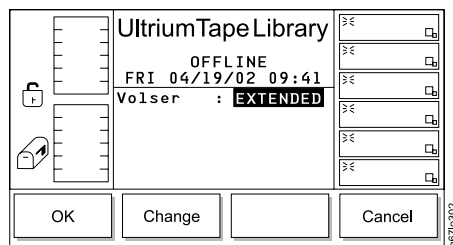
Figure 362. Media Dialog with the Volser field set to EXTENDED

6. Press the button below the **OK** softkey. The Reinventory screen displays (see Figure 363).
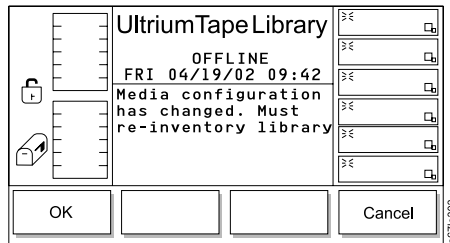
Figure 363. Reinventory screen

7. Press the button below the **OK** softkey. The library reinventories the cartridges and returns to the Library Submenu (see Figure 360 on page 233).

8. To return to the Main Menu, press the button below the **More** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Uploading Library Error Log Information by Using the RMU

The RMU's Diagnostics file page is protected by a password and allows you to upload (to a local computer) the diagnostic information from the attached library. The diagnostic information may be useful to service personnel in diagnosing problems. Information from the library (command and error logs) and information from the RMU's Error Log can be retrieved in text form by selecting the Diagnostics file page or Logs page from the RMU. The system snapshot is a machine-decodable file which can only be used by service personnel (see Figure 364).
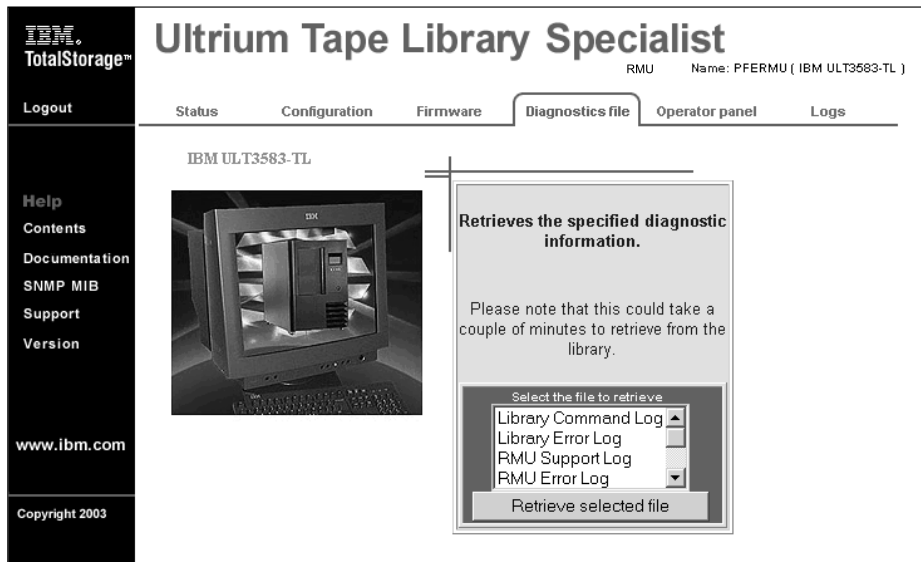
Figure 364. Diagnostics file page

Updating Firmware

Attention::

1. To ensure optimum performance from the Ultrium Scalable Tape Library, use the latest level of firmware. It is the customer's responsibility to obtain and install all firmware.

2. Before visiting the web to obtain the latest level of library firmware, you must determine which generation of library firmware that you have. The firmware for a library without the Multi-Path feature starts with 2.xx.xxxx; the firmware for a library with the Multi-Path feature starts with 5.xx.xxxx. A library without the Multi-Path feature cannot be loaded on a library that is already enabled with the Multi-Path feature.

You can update firmware for the drives, the library, or the RMU by using the following methods:

- RMU
- SCSI bus
- FMR tape (drive firmware only)
- Library serial port (library firmware only)
- SAN Data Gateway Module (optional, if the library has an optional SAN Data Gateway Module installed; see the section about updating firmware in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*)

Note: Before updating firmware on the drives, the library, or the RMU, use your server to set the library and drives OFFLINE for all attached servers.

To find out whether the drives, the library, or the RMU are loaded with the most current firmware, go to the web at `http://www.ibm.com/storage/lto` and click **Technical Support**. Compare the current level of firmware against the firmware on the device.

- To view the level of firmware currently loaded on a drive, select **Main Menu (initial screen) —> Status —> Drives**. The Drives Dialog displays (see Figure 365).
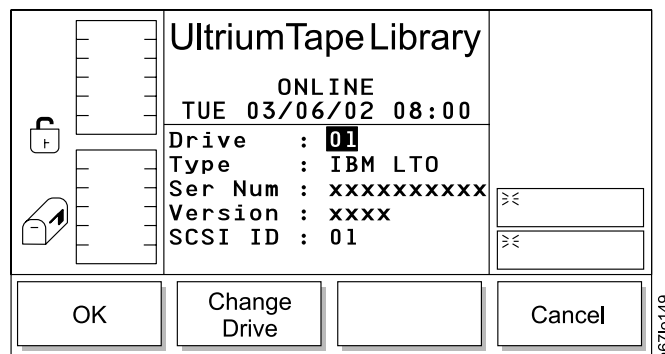
Figure 365. Drives Dialog

- To view the level of firmware currently loaded on the library, select **Main Menu (initial screen) —> More —> About**. The About Menu displays (see Figure 366).
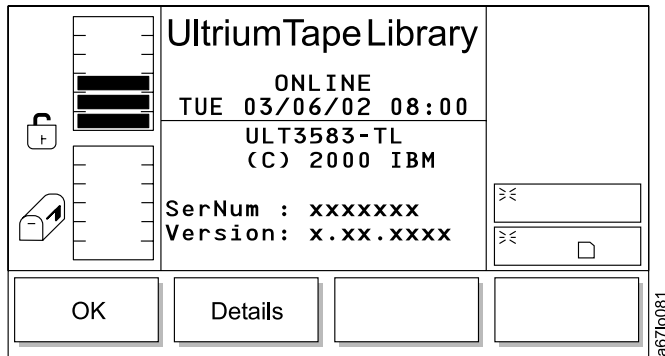
Figure 366. About Menu

- You can also view the level of firmware currently loaded on the library or the RMU by opening the RMU web page and selecting the Status tab. The current status of the library displays (see Figure 367).
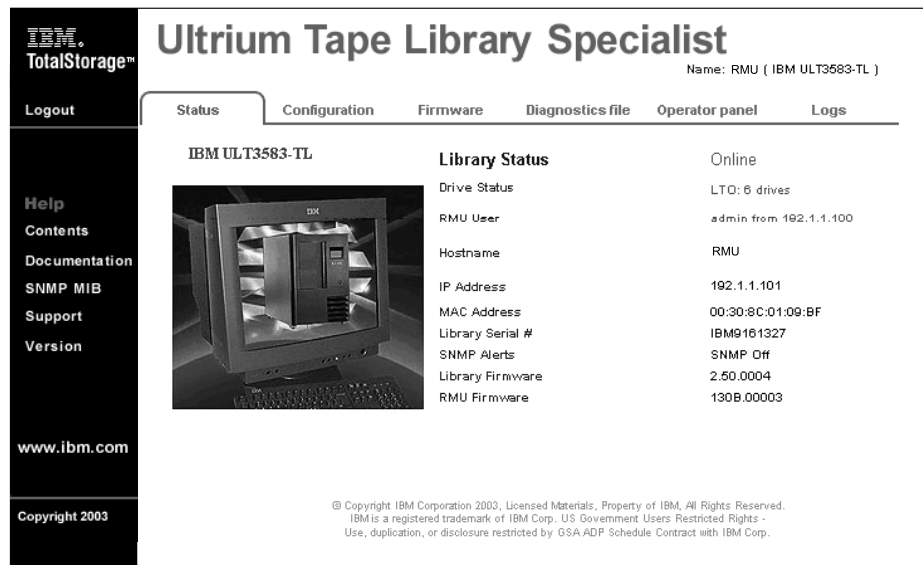
Figure 367. Status page

Updating All Firmware by Using the RMU

To update firmware for the drives, the library, or the RMU by using the RMU, perform the following steps:

Note: Updating firmware on the drives by using the RMU takes approximately 50 minutes for the first drive and 15 minutes for each additional drive. If you update firmware on the first drive by using the RMU you can update firmware on additional drives by using an FMR tape (refer to "Creating or Erasing an FMR Tape" on page 227, then "Updating Drive Firmware by Using an FMR Tape" on page 239.

1. Obtain the new firmware image by visiting the web at `http://www.ibm.com/storage/lto` and clicking on **Technical Support**.

2. Download the new firmware file to a directory (or diskette) on your PC. Examples of filenames are:

   `C:\xxxxxx.lif` for library firmware

   `C:\xxxxxx.ifl` for RMU firmware

   `C:\xxxxxx.fmr` for drive firmware

3. Use your web browser to access the TotalStorage Specialist, then select the Firmware tab (login, if necessary). The RMU firmware page displays (see Figure 368).

4. Select the item that you want to update (Library, RMU, or DriveX).

5. Enter the path and firmware filename, or browse for the file on your PC (the file that you previously downloaded from the web).

6. Select `Update Firmware`.
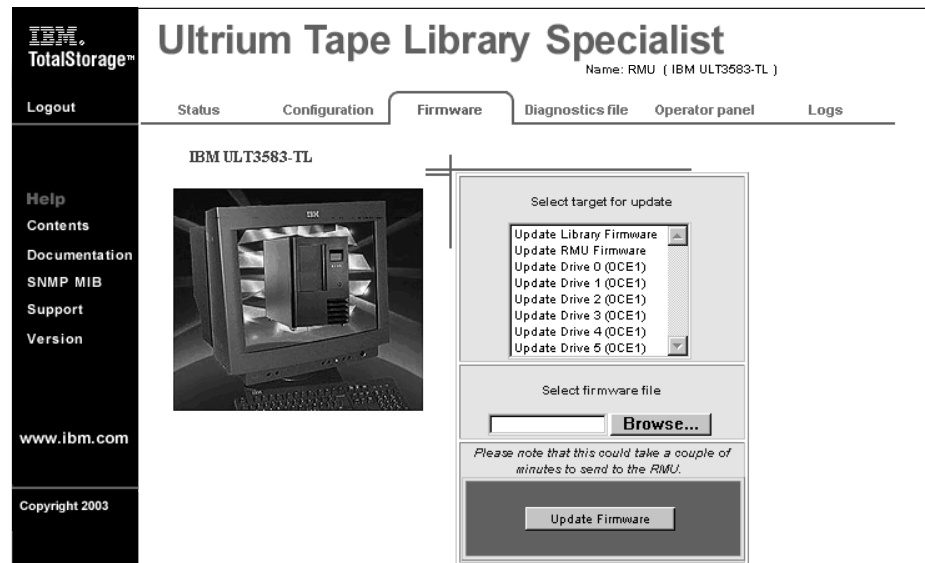
Figure 368. RMU firmware page

Updating Library and Drive Firmware by Using the SCSI Bus

Note: For libraries with the Multi-Path feature, the update could take as long as 2 hours when using the SCSI path.

You can update library and drive firmware over your server's SCSI bus by using the device drivers and utilities that are supplied by IBM. Before updating library or drive firmware, you must:

1. Obtain the new firmware file
2. Install the proper IBM device drivers
3. Install the proper IBM utility (NTUTIL or TAPEUTIL)

To obtain the new firmware, download it from the web to the server by visiting `http://www.ibm.com/storage/lto` and selecting **Technical Support**. If the library contains a drive that is already loaded with the new firmware, you may obtain the firmware by creating a field microcode replacement (FMR) tape cartridge from that drive (see "Creating or Erasing an FMR Tape" on page 227).

For instructions about installing and using the appropriate IBM device drivers and utilities (such as NTUTIL or TAPEUTIL), refer to the *IBM Ultrium Device Drivers Installation and User's Guide* that was shipped with the library. Or, for the latest version of the user's guide visit the web at `http://www.ibm.com/storage/lto` and select **Technical Support**. To obtain instructions about using NTUTIL or TAPEUTIL, visit the web at `http://www.ibm.com/storage/lto` and perform the following:

1. At **Need More Information?**, select **Technical Support**.
2. At **Products**, select **Appropriate Product**.
3. At **Downloads**, select **Firmware**.
4. At **Downloadable Files**, select **How to Update IBM Ultrium Tape Device Firmware (FMR)**, then select the appropriate device and utility.

Note: It may be necessary to disable or remove any device driver that was supplied with a commercial backup application before using the device driver supplied by IBM. Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* and the documentation provided with your backup application software to determine if there are conflicts.

After you have obtained the new drive firmware file, loaded the appropriate IBM device drivers (if necessary), and installed the proper utility, refer to the instructions for updating library or drive firmware in the *IBM Ultrium Device Drivers Installation and User's Guide*.

Updating Drive Firmware by Using an FMR Tape

You can update a drive's firmware by using a field microcode replacement (FMR) tape. If the library contains a drive that is already loaded with the new firmware, create an FMR tape from that drive (see "Creating or Erasing an FMR Tape" on page 227).

After you have obtained an FMR tape with the new drive firmware file, update the drive's firmware by performing the following steps.

Shortcut: Main Menu (initial screen) —> Command —> Drives —> Firmware Update
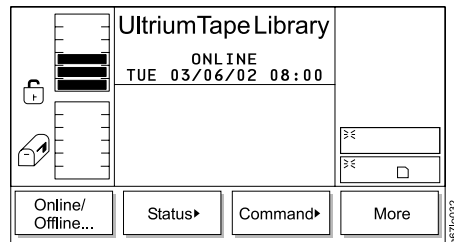
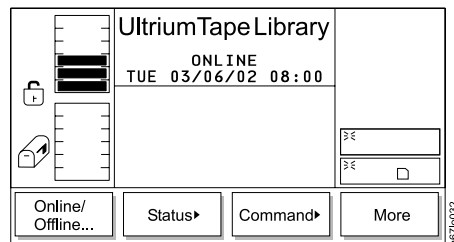*Figure 369. Main Menu (initial screen)*

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 370).
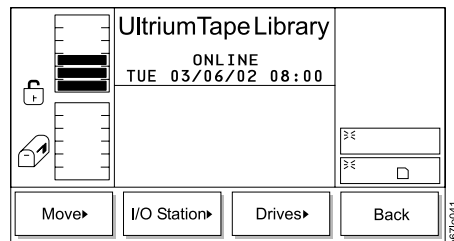
*Figure 370. Command Menu*

2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 371 on page 240).
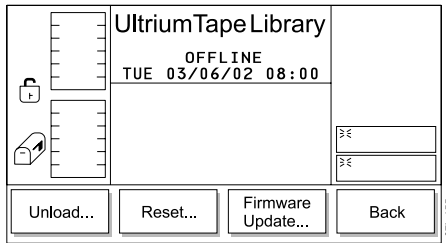
Figure 371. Drives Submenu

3. Press the button below the **Firmware Update** softkey. The Firmware Update Dialog displays (see Figure 372).
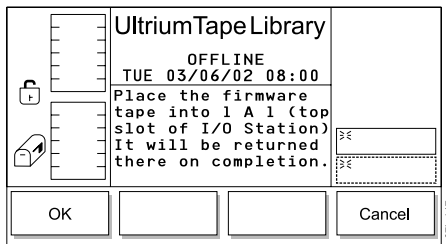
Figure 372. Firmware Update Dialog

4. Open the door of the I/O station.
5. Place the FMR tape cartridge into the top slot of the I/O station.
6. Close the door of the I/O station. The library executes the TEACH and INVENTORY procedures.
7. Press the button below the **OK** softkey. The Select Drive Dialog displays a list of installed tape drives and their current level of firmware (see Figure 373). The checkboxes in the left column contain checkmarks that indicate which drives are to be updated. The default is to update all drives (all checkboxes contain checkmarks).
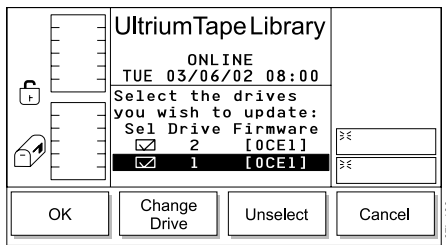
Figure 373. Select Drive Dialog

8. Choose which drive to update by performing the following steps:
   a. Press the button below the **Change Drive** softkey until the number of the drive that you want is highlighted.
   b. Decide which drives you want to update. To cancel an update, press the button below the **Unselect** softkey until the checkmark disappears from the checkbox. To reselect an update, press the button below the **Select** softkey.

   To deselect multiple drives, repeat steps 8a and 8b.

9. Press the button below the **OK** softkey. The Firmware Update Starting Dialog displays (see Figure 374) and the update begins.
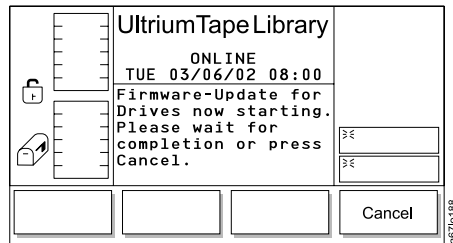
Figure 374. Firmware Update Starting Dialog

The picker takes the FMR tape cartridge from the I/O station and places it into the first selected drive. The drive updates the firmware and unloads the cartridge. The picker then removes the cartridge from the drive and places it back into the I/O station until the updated drive completes rebooting. If the reboot was successful, the picker then places the FMR cartridge into the next drive that you selected (if applicable). After the firmware on the last selected drive is updated, the picker removes the tape from that drive and returns it into the top slot of the I/O station. The operator panel displays the confirmation message `Drive migration finished.`

10. To return to the Drives Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Updating Library Firmware by Using the Library's Serial Port

Go to the web at `http://www.ibm.com/storage/lto` (see the **Technical Support** section), download `appcode.exe` to a temporary directory on your PC, and execute it. The downloaded file, `appcode.exe`, creates two files: the latest library firmware (for example, `V2.62.01.lif`) and an executable file (`download.exe`).

1. Power-off the library.

2. Open a command prompt window and change the current directory to the temporary directory where `appcode.exe` was extracted.

3. Connect the serial cable P/N 19P1945 between the PC and the serial port located on the SCSI host interface board.

4. From the command prompt, type the following command and press Enter:

```
download -cx -fxxxxxx.lif
```

Where:

download   Firmware Download Command

–c   Required characters that precede the Communication Port Number

–x   Communication Port Number

–f   Required characters that precede the file name

xxxxxx.lif   File name (v2.00.00.lif for libraries without the Multi-Path feature; v5.00.00.lif for libraries with the Multi-Path feature)

The message Waiting for ALIVE message displays

Note: For help enter the command:

```
download -h
```

5. After the message `Waiting for ALIVE message` displays, power-on the library.

After downloading firmware, verify the installation by using the inquiry command available on the utilities menu of your server, or from the library operator panel select **Main Menu (initial screen) —> More —> About**.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

Retrieving Inquiry Data

Two methods are available for retrieving the SCSI inquiry identification of the tape library:

Host utility
> To retrieve SCSI inquiry data by using your server and a utility such as TAPEUTIL or NTUTIL, refer to the documentation for your server.

RMU　To retrieve inquiry data using the RMU, open an web browser and type the IP address or hostname of the RMU. The TotalStorage Specialist Status page displays. The SCSI inquiry data of the library is shown in the upper right corner of the web page (for example, `Name: RMU (IBM ULT3583-TL)`).

Cleaning Drives

Whenever a drive requires cleaning, it alerts you with a message on the library operator panel or host console. The library uses the IBM TotalStorage Cleaning Cartridge or the IBM LTO Ultrium 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. All cleaning cartridges that are processed by the library must bear a bar code label.

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.

Three methods of cleaning the Ultrium Tape Drive are available:

Automatic cleaning
Automatic cleaning enables the Ultrium Scalable 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. The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. The cleaning cartridge must be located in a nonaddressable storage slot. For more information, see "Library Columns" on page 8.

Host cleaning
Host/Application maintained and activated is the default condition. Host cleaning enables the server to detect the need to clean an Ultrium Tape Drive and to control the cleaning process. The cleaning cartridge must be stored in one of the available storage slots within the library. For more information, see the section about cleaning in your application software documentation.

Manual cleaning
Manual cleaning requires that you use the Move Media command from the library's operator panel to insert a cleaning cartridge into the library to perform cleaning on one or more of the Ultrium Tape Drives (see "Moving a Cartridge" on page 127).

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.

Cleaning the drive on a periodic basis is not recommended. Only clean the drive when the cleaning symbol displays in the drive status area of the operator panel (see Figure 62 on page 82).

Chapter 5. Using the Media

⚠ **Attention:** IBM LTO Ultrium Tape Cartridges are delicate components and require care in handling. Before using the media, be sure to read "Handling the Cartridges" on page 251.

The IBM TotalStorage Ultrium Scalable Tape Library 3583 uses the following cartridge types:

- IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
- IBM LTO Ultrium Data Cartridge (Ultrium 1)
- IBM TotalStorage LTO Ultrium Cleaning Cartridge
- LTO Ultrium Cleaning Cartridge

The Ultrium 2 Tape Drive is compatible with the cartridges of its predecessor, the Ultrium 1 Tape Drive. When labeled according to proper IBM bar code label specifications (see "Bar Code Label" on page 248), the last character of the cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge. Cartridge compatibility for the Ultrium 2 Tape Drive is as follows:

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

Figure 375 shows the TotalStorage LTO Ultrium 200 GB Data Cartridge and its components.

1	LTO cartridge memory	**4**	Write-protect switch
2	Cartridge door	**5**	Label area
3	Leader pin	**6**	Insertion guide
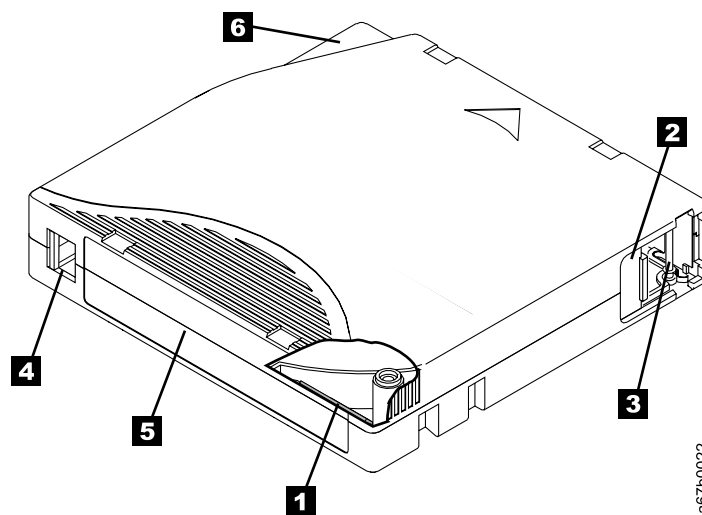
Figure 375. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge

In addition to using LTO Ultrium 2 Tape Cartridges with up to 200 GB capacity, the tape drive reads and writes to certified LTO Ultrium Tape Cartridges that have capacities of 100, 50, 30, and 10 GB. If you want to control the capacity of the cartridge (for example, if you want to limit the capacity to obtain a faster seek time) you can do so by issuing the SCSI command SET CAPACITY. For information about this command, refer to the *IBM TotalStorage Ultrium Scalable Tape Library 3583 SCSI Reference*.

To ensure that your tape library conforms to IBM's specifications for reliability, use only IBM LTO Ultrium Tape Cartridges. You may use other LTO-certified data cartridges, but they may not meet the standards of reliability established by IBM. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge cannot be interchanged with the media used in other IBM non-LTO Ultrium tape products.

Data Cartridge

The IBM Ultrium 2 Data Cartridge is purple, and the Ultrium 1 Data Cartridge is black. Both generations contain 1/2-inch, dual-coat, metal-particle tape. The Ultrium 1 cartridge has a native data capacity of 100 GB (200 GB at 2:1 compression); the Ultrium 2 cartridge has a native data capacity of 200 GB (400 GB at 2:1 compression).

When processing tape in the cartridges, the Ultrium Tape Drives use a linear, serpentine recording format. The Ultrium 1 drive reads and writes data on 384 tracks, eight tracks at a time; the Ultrium 2 drive reads and writes data on 512 tracks, eight tracks at a time The first set of eight tracks is written from near the beginning of the tape to near the end of the tape. The head then repositions to the next set of eight tracks for the return pass. This process continues until all tracks are written and the tape is full, or until all data is written.

Both generations of the IBM LTO Ultrium Data Cartridge includes a Linear Tape-Open Cartridge Memory (LTO-CM) chip (**1** in Figure 375 on page 245), 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. Whenever you unload a tape cartridge, the Ultrium Scalable Tape Library writes any pertinent information to the cartridge memory.

The cartridge door (**2** in Figure 375 on page 245) protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader pin **3**. When you insert the cartridge into the drive, a threading mechanism pulls the pin (and tape) out of the cartridge, across the drive head, and onto a non-removable takeup reel. The head can then read or write data from or to the tape.

The write-protect switch **4** prevents data from being written to the tape cartridge. On the data cartridge, the switch is red; on the cleaning cartridge, the switch is gray. The label area **5** provides a location for you to place a label. Affix only a bar code label or a human-writable 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 Ultrium Scalable Tape Library The insertion guide **6** is a large, notched area that prevents you from inserting the cartridge incorrectly.

You can order tape cartridges with the bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see "Ordering Media Supplies" on page 264. The bar code and bar code label must meet predefined

specifications. To determine the specifications, visit the web at
`http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec.pdf` or
contact your IBM Marketing Representative.

Both generations of the LTO Ultrium Data Cartridge have a nominal cartridge life of
5000 load and unload cycles.

Cleaning Cartridge

Each drive determines when it needs to be cleaned and alerts the library and the
server's application software. Depending on which cleaning method you choose, the
drive 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 "Cleaning Drives" on page 244).

Note: The 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.

The IBM TotalStorage LTO Ultrium Cleaning Cartridge and the LTO Ultrium
Cleaning Cartridge are downward-compatible with the Ultrium 1 drive. To enable
your Ultrium 1 drive to use the cartridge, simply download and install the latest drive
firmware (for instructions, see "Updating Firmware" on page 235). Certain conditions
apply to mixing drives and media. For information, see "Mixing Drive Types" on
page 14.

Both generations of the LTO Ultrium Cleaning Cartridge are valid for 50 uses. A
cartridge's LTO-CM chip tracks the number of times that the cartridge is used.

Bar Code Label

Each data and cleaning cartridge that is processed by the Ultrium Scalable 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 library. The bar code tells the library whether the cartridge is a data, cleaning, or diagnostic cartridge. If a cartridge in a storage or I/O station slot does not contain a label, the bar code reader will treat that slot as empty. In addition, the bar code includes the two-character media-type identifier Lx, where x equals 1 or 2. L identifies the cartridge as an LTO cartridge. 1 indicates that the cartridge is the first generation of its type; 2 indicates that the cartridge is the second generation of its type. Figure 376 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 264. The bar code must meet predefined specifications. To determine the specifications of the bar code and the bar code label, visit the web at `http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec.pdf` or contact your IBM Marketing Representative.

When attaching a bar code label to a tape cartridge, place the label only in the recessed label area (see **5** in Figure 375 on page 245). 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 Ultrium Scalable Tape Library from reading the label.
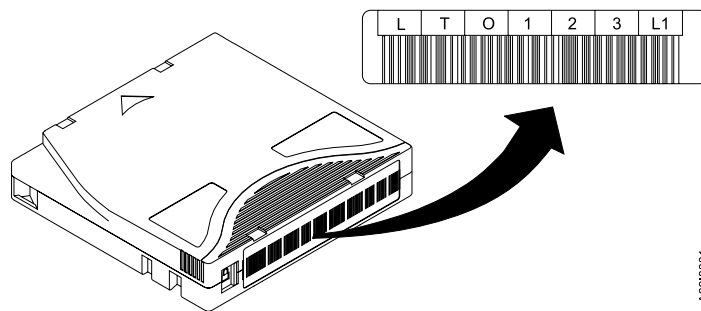
Figure 376. Sample bar code label on the LTO Ultrium Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.

Guidelines for Using Bar Code Labels

Apply the following guidelines whenever you use bar code labels:

- Use only IBM-approved bar code labels.
- Do not reuse a label or reapply a used label over an existing label.
- Before you apply a new label, remove the old label by slowly pulling it at a right angle to the cartridge case.
- Use peel-clean labels that do not leave a residue after they are removed. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger; do not use a sharp object, water, or other 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 software's inventory operation will take much longer if the bar code label is not readable).
- Remove the label from the label sheet carefully. Do not stretch the label or cause the edges to curl.
- Position the label within the recessed label area (see **5** in Figure 375 on page 245).
- With light finger pressure, smooth the label so that no wrinkles or bubbles exist on its surface.
- Verify that the label is smooth and parallel, and has no roll-up or roll-over. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label and have no folds, missing pieces, or smudges.
- Do not place other machine-readable labels on other surfaces of the cartridge. They may interfere with the ability of the bar code reader to read the bar code.

Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 377) determines whether you can write to the tape:

- If the switch is set to ⬚ (solid red), data cannot be written to the tape.
- If the switch is set to unlocked (black void), data can be written to the tape.

If possible, use your server's application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the server's software to identify a cartridge that no longer contains current data and is eligible to become a scratch cartridge. Do not write-protect scratch (blank) cartridges; the tape drive will not be able to write new data to them.

If you must manually set the switch, slide it left or right to the desired position.
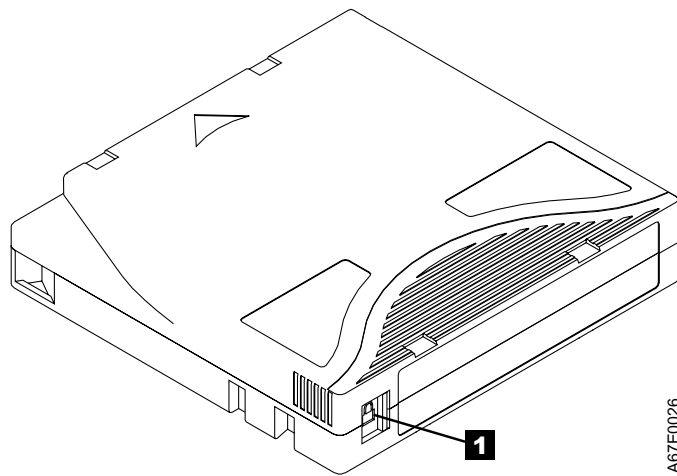
Figure 377. Setting the write-protect switch

Handling the Cartridges

⚠️

Attention: Do not insert a damaged tape cartridge into your Ultrium Scalable Tape Library. A damaged cartridge can interfere with the reliability of a drive and may void the warranties of the drive and the cartridge. Before inserting a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for breaks. If you need to recover data from a damaged cartridge, contact your IBM Service Representative.

Incorrect handling or an incorrect environment can damage the IBM LTO Ultrium Tape Cartridges or their magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your IBM LTO Ultrium Tape Drives, use the following guidelines:

Provide Training

- Post procedures that describe proper media handling in places where people gather.
- Ensure that anyone who handles tape has been properly trained in handling and shipping procedures. This includes operators, users, programmers, archival services, and shipping personnel.
- Ensure that any service or contract personnel who perform archiving are properly trained in media-handling procedures.
- Include media-handling procedures as part of any services contract.
- Define and make personnel aware of data recovery procedures.

Ensure Proper Packaging

- When you ship a cartridge, ship it in its original or better packaging.
- Always ship or store a cartridge in a jewel case.
- Use only a recommended shipping container that securely holds the cartridge in its jewel case during transportation. Ultrium Turtlecases (by Perm-A-Store) have been tested and found to be satisfactory (see Figure 378 on page 252). They are available at `www.turtlecase.com`.

Figure 378. Tape cartridges in a Turtlecase

- Never ship a cartridge in a commercial shipping envelope. Always place it in a box or package.
- If you ship the cartridge in a cardboard box or a box of a sturdy material, ensure the following:
  - Place the cartridge in polyethylene plastic wrap or bags to protect it from dust, moisture, and other contaminants.
  - Pack the cartridge snugly; do not allow it to move around.
  - Double-box the cartridge (place it inside a box, then place that box inside the shipping box) and add padding between the two boxes (see Figure 379).

Figure 379. Double-boxing tape cartridges for shipping

Provide Proper Acclimation and Environmental Conditions

- Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation on the cartridge or in the drive (the time will vary, depending on the environment extremes to which the cartridge and drive were exposed).
- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not expose the cartridge to moisture or direct sunlight.
- Do not expose recorded or blank cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment, or fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in "Environmental and Shipping Specifications for Tape Cartridges" on page 255.

Perform a Thorough Inspection

After purchasing a cartridge and before using it, perform the following steps:

- Inspect the cartridge's packaging to determine potential rough handling.
- When inspecting a cartridge, open only the cartridge door. Do not open any other part of the cartridge case. The upper and lower parts of the case are held together with screws; separating them destroys the usefulness of the cartridge.
- Inspect the cartridge for damage before using or storing it.
- Inspect the rear of the cartridge (the part that you load first into the tape load compartment) and ensure that there are no gaps in the seam of the cartridge case (see **1** in Figure 380 and **4** in Figure 383 on page 258). If there are gaps in the seam (see Figure 380), the leader pin may be dislodged. Go to "Repositioning or Reattaching a Leader Pin" on page 257.
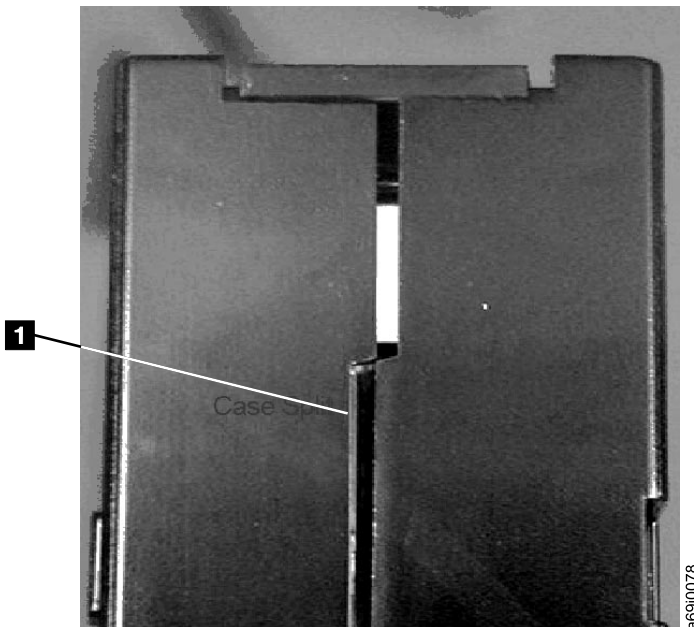
Figure 380. Checking for gaps in the seams of a cartridge

- Check that the leader pin is properly seated.
- If you suspect that the cartridge has been mishandled but it appears useable, copy any data onto a good cartridge immediately for possible data recovery. Discard the mishandled cartridge.
- If you must recover data from a damaged cartridge, contact your service representative.
- Review handling and shipping procedures.

Handle the Cartridge Carefully

- Do not drop the cartridge. If the cartridge drops, slide the cartridge door back and ensure that the leader pin is properly seated in the pin-retaining spring clips (see **2** in Figure 382 on page 257). If the leader pin has become dislodged, go to "Repositioning or Reattaching a Leader Pin" on page 257.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape's surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Do not stack more than six cartridges.
- Do not degauss a cartridge that you intend to reuse. Degaussing makes the tape unusable.

Examples of Cartridge Problems

Example: Improper Placement of Leader Pin

The leader pin is misaligned. Perform the following steps:

1. Look for cartridge damage.
2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see "Repositioning a Leader Pin" on page 257). Then, immediately use data recovery procedures to minimize chances of data loss.

Example: Split Cartridge Case

The cartridge's case is damaged. There is a high possibility of media damage and potential loss. Perform the following steps:

1. Look for cartridge mishandling.
2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see "Repositioning a Leader Pin" on page 257). Then, immediately use data recovery procedures to minimize chances of data loss.
3. Review media-handling procedures.

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation on the cartridge or in the drive (the time will vary, depending on the environment extremes to which the cartridge and drive were exposed).

The best storage container for the cartridges (until they are opened) is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

When you ship a cartridge, place it in its jewel case or in a sealed, moisture-proof bag to protect it from moisture, contaminants, and physical damage. Ship the cartridge in a shipping container that has enough packing material to cushion the cartridge and prevent it from moving within the container.

Table 22 gives the environment for operating, storing, and shipping IBM LTO Ultrium Tape Cartridges.

Table 22. Environment for operating, storing, and shipping the IBM LTO Ultrium Tape Cartridge

Environmental Specifications				
Environmental Factor	**Operating**	**Operational Storage**	**Archival Storage**	**Shipping**
Temperature	10 to 45°C (50 to 113°F)	16 to 32°C (61 to 90°F)	16 to 25°C (61 to 77°F)	−23 to 49°C (−9 to 120°F)
Relative humidity (noncondensing)	10 to 80%	20 to 80%	20 to 50%	5 to 80%
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.				

Cleaning the Bar Code Reader

If the bar code reader is unable to read a bar code label, the window on the reader may need to be cleaned.

1. Open the front door of the library.
2. Wipe the bar code reader window (**1** in Figure 381 on page 256) with a lint-free cloth.
3. Close the front door of the library and retry any operation that was interrupted.
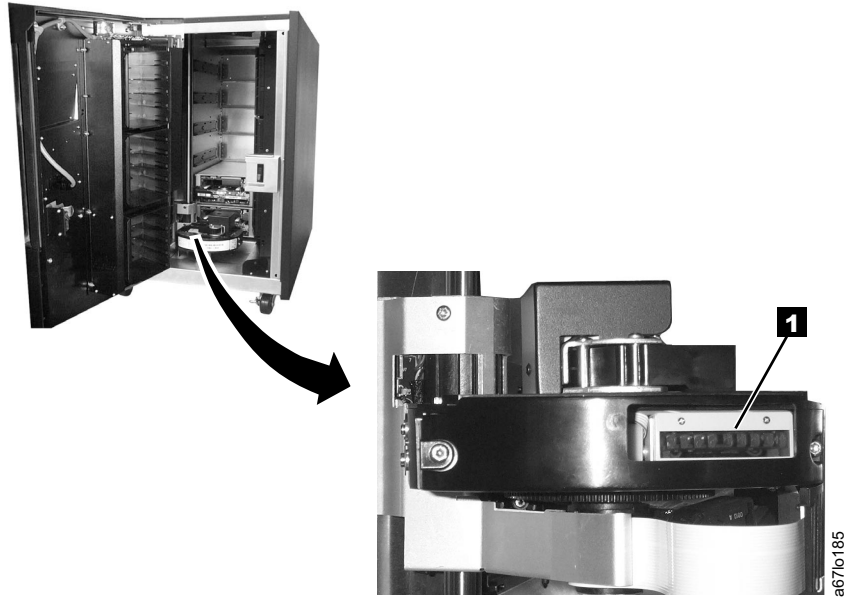
Figure 381. Cleaning the bar code reader

Repositioning or Reattaching a Leader Pin

⚠ **Attention:** Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

If the leader pin in your cartridge becomes dislodged from its pin-retaining spring clips or detaches from the tape, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reposition or reattach it. (Do not reattach the pin if you must remove more than 7 meters (23 feet) of leader tape.) The sections that follow describe each procedure.

Repositioning a Leader Pin

A leader pin that is improperly seated inside a cartridge can interfere with the operation of the drive. Figure 382 shows a leader pin in the incorrect **1** and correct **2** positions.

To place the leader pin in its proper position, you will need the following tools:
- Plastic or blunt-end tweezers
- Cartridge manual rewind tool (from Leader Pin Reattachment Kit, part number 08L9129)
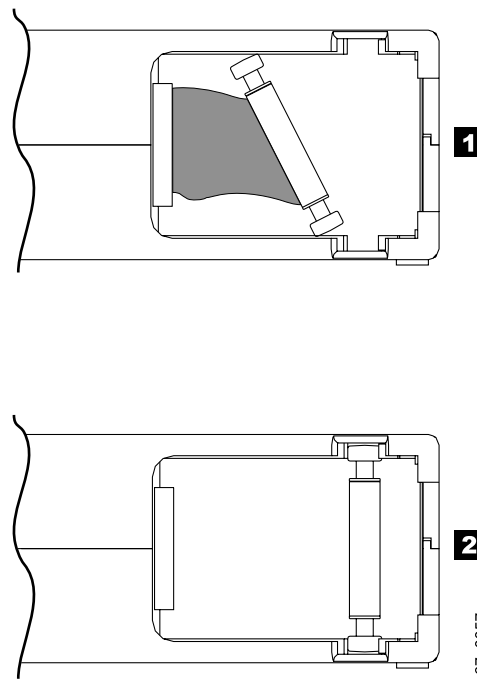
Figure 382. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (**1** in Figure 383) and locate the leader pin **2** (you may need to shake the cartridge gently to roll the pin toward the door).
2. With plastic or blunt-end tweezers, grasp the leader pin and position it in the pin-retaining spring clips **3** .
3. Press the leader pin gently into the clips until it snaps into place and is firmly seated. Ensure that there are no gaps in the seam of the cartridge **4** .

   Attention: If gaps exist, do not continue with this procedure and do not use the cartridge. Instead, contact your IBM Service Representative.
4. Close the cartridge door.
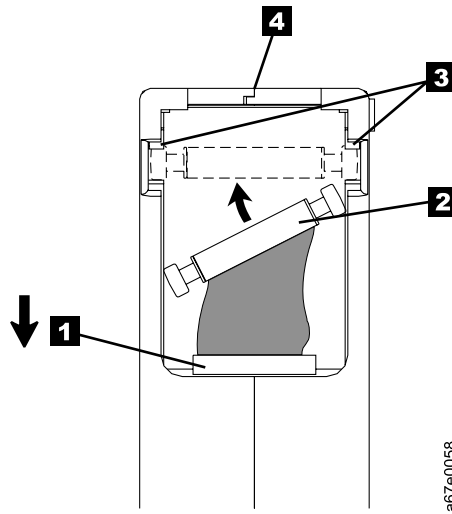
Figure 383. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (**1** in Figure 384) into the cartridge's hub **2** and turn it clockwise until the tape becomes taut.
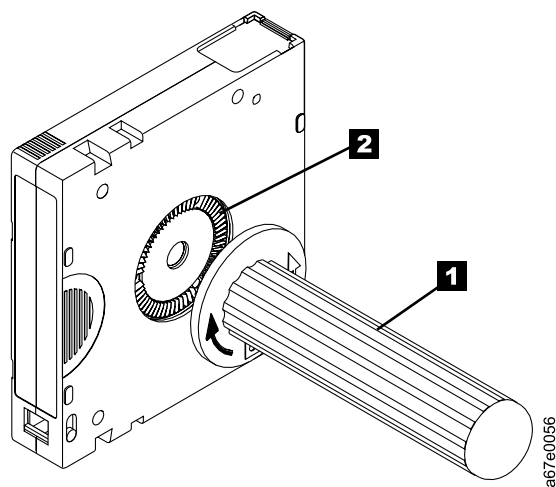
Figure 384. Rewinding the tape into the cartridge

6. Remove the rewind tool by pulling it away from the cartridge.

Reattaching a Leader Pin

The first meter of tape in a cartridge is leader tape. Once the leader tape has been removed there is a possibility of tape breakage. After reattaching the leader pin, transfer data from the defective tape cartridge. **Do not reuse the defective tape cartridge**.

The Leader Pin Reattachment Kit contains three parts:

- **Leader pin attach tool** (see **1** in Figure 385). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure 385). 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 385). 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.
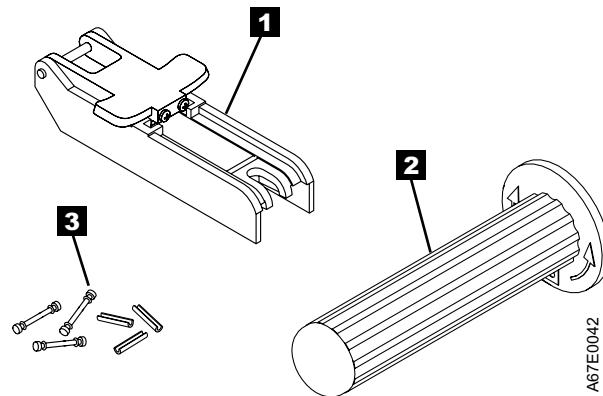
Figure 385. Leader Pin Reattachment Kit

The following procedure describes how to reattach a leader pin.

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

1. Attach the leader pin attach tool (**1** in Figure 386) 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** .

A67E0033
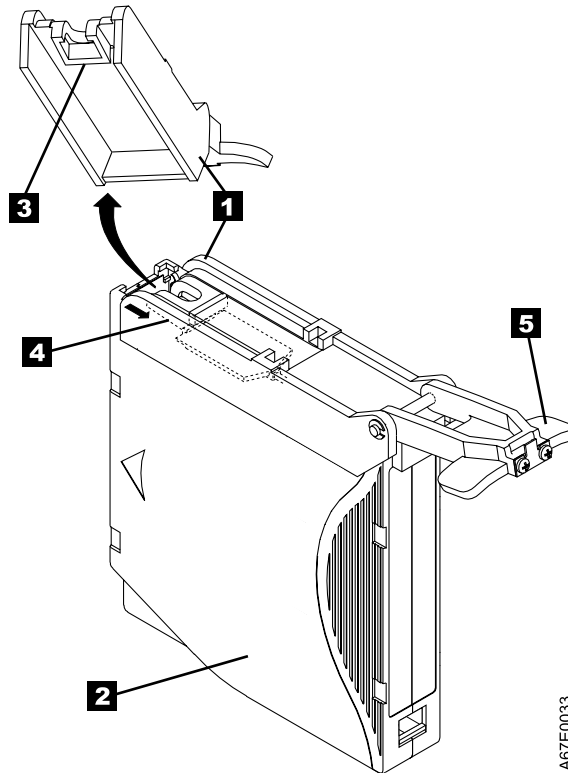
Figure 386. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 387) to the cartridge's hub **2** by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you see the end of the tape inside the cartridge. Then, slowly turn the rewind tool counterclockwise to bring the tape edge toward the cartridge door **3**.

3. Continue to turn the rewind tool counterclockwise until approximately 13 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.

4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.
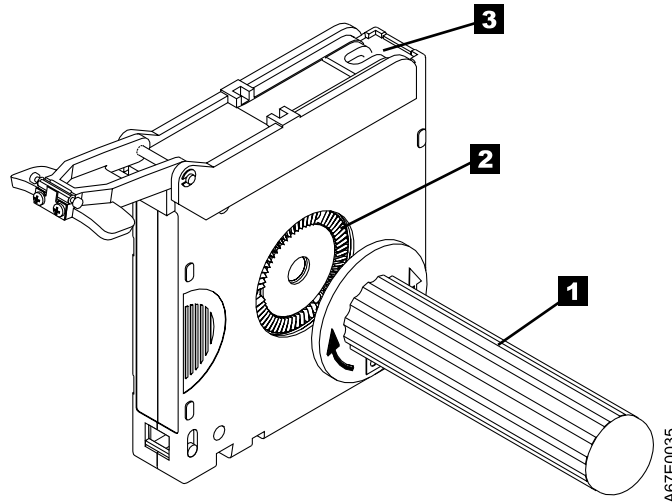
Figure 387. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (**1** in Figure 388), locate the open side of the C-clip **2**. The C-clip is a small black part that secures the tape **3** to the pin.

6. Remove the C-clip from the leader pin by using your fingers to push the clip away from the pin. Set the pin aside and discard the clip.
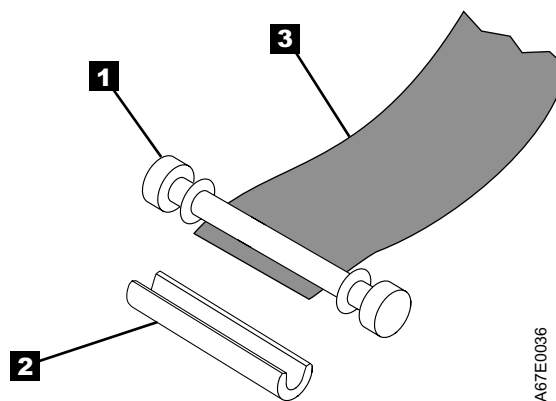
Figure 388. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure 389).

8. Place a new C-clip into the retention groove **2** (Figure 389) on the leader pin attachment tool and make sure that the clip's open side faces up.

9. Place the leader pin (from step 6 on page 261) into the cavity **3** (Figure 389) of the leader pin attach tool.

Attention: To prevent the leader pin from rolling into the cartridge, in the following step use care when folding the tape over the pin.

10. Fold the tape over the leader pin and hold it with your fingers (see Figure 389).

> **Note:** Use care to ensure that the tape is centered over the leader pin. Failure to properly center the tape on the pin will cause the repaired cartridge to fail. When the tape is properly centered, a 0.25-mm (0.01-in.) gap exists on both sides of the pin.
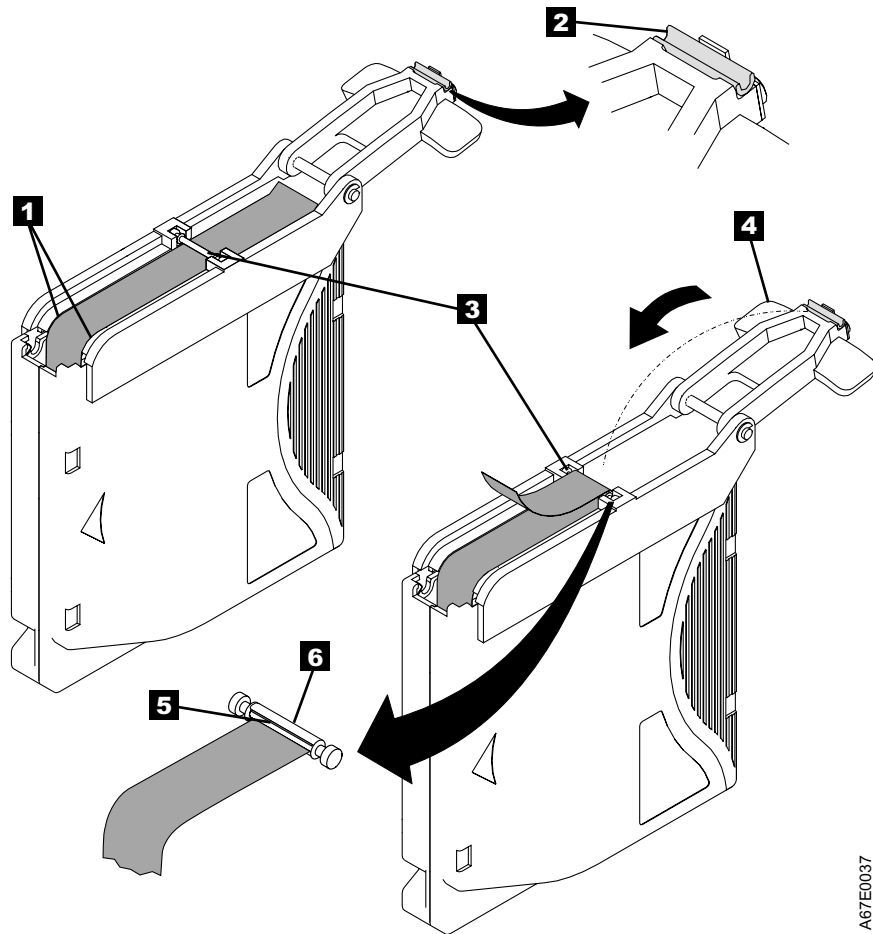
Figure 389. Attaching the leader pin to the tape

11. Close the pivot arm **4** of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.

12. Swing the pivot arm open and trim the excess tape **5** so that it is flush with the reattached leader pin **6** .

13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.
15. Remove the rewind tool.
16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.

Attention: Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

Disposing of Tape Cartridges

Under the current rules of the U.S. Environmental Protection Agency (EPA), regulation 40CFR261, the LTO Ultrium Tape Cartridge is classified as non-hazardous waste. As such, it may be disposed of in the same way as normal office trash. These regulations are amended from time to time, and you should review them at the time of disposal.

If your local, state, country (non-U.S.A.) or regional regulations are more restrictive than EPA 40CFR261, you must review them before you dispose of a cartridge. Contact your account representative for information about the materials that are in the cartridge.

If a tape cartridge must be disposed of in a secure manner, you can erase the data on the cartridge by using a high-energy ac degausser (use a minimum of 1200 oersted peak field over the entire space that the cartridge occupies). Degaussing makes the cartridge unusable.

If you burn the cartridge and tape, ensure that the incineration complies with all applicable regulations.

Ordering Media Supplies

Table 23 lists the data cartridges and media supplies that you can order for the Ultrium Scalable Tape Library.

Table 23. Ordering media supplies for the Ultrium Scalable Tape Library

Supply Item	Method of Ordering
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 265).	• Order as part number 08L9870 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative. • Call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Bar code labels are preapplied to cartridges.	• Order as part number 19P5887 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). Specify the VOLSER characters that you want. • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative. Specify the VOLSER characters that you want. • Call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM LTO Ultrium 100 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 265).	• Order as part number 08L9120 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 003. • Call 1-888-IBM-MEDIA.

Table 23. Ordering media supplies for the Ultrium Scalable Tape Library (continued)

Supply Item	Method of Ordering
IBM LTO Ultrium 100 GB Data Cartridge Bar code labels are preapplied to cartridges.	• Order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative by specifying Machine Type 3589 Model 002. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal cleaning cartridge for use with Ultrium 1 and Ultrium 2 drives) Order VOLSER labels separately (see "Ordering Bar Code Labels").	• Order as part number 35L2086 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative. • Call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal cleaning cartridge for use with Ultrium 1 and Ultrium 2 drives) Bar code labels are preapplied to cartridges.	• Order as part number 35L2087 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`). • If you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative. • Call 1-888-IBM-MEDIA.
Leader Pin Reattachment Kit	Order as part number 08L9129 through an IBM-authorized distributor (for the closest distributor, visit the web at `http://www.ibm.com/storage/media`).

Ordering Bar Code Labels

Bar code labels with VOLSERS are required for cartridges that are read by the Ultrium Scalable Tape Library. You can order these labels separately from the IBM Data Cartridges and Cleaning Cartridges.

You can order bar code labels directly from the authorized label suppliers in Table 24.

Table 24. Authorized suppliers of custom bar code labels

In America	In Europe and Asia
EDP/Colorflex 697 South Pierce Street Louisville, CO 80027 U. S. A. Telephone: 800-522-3528 `http://www.colorflex.com/Ai/Home.asp`	EDP Europe, Ltd. 43 Redhills Road South Woodham Ferrers Chelmsford, Essex CM3 5UL U. K. Telephone: 44 (0) 1245-322380 `http://www.edpeurope.com/media_labelling.htm`
Dataware 7570 Renwick Houston, TX 77081 U. S. A. Telephone: 800-426-4844 `http://www.datawarelabels.com/`	Dataware Labels Europe Heubergstrasse 9 D-83052 Bruckmuhl-Gotting Germany Telephone: 49 806-29455 `http://www.datawarelabels.com/`

Table 24. Authorized suppliers of custom bar code labels (continued)

In America	In Europe and Asia
NetC P. O. Box 320784 Fairfield, CT 06432 U. S. A. Telephone: 203-372-6382 http://www.netcllc.com/	NetC Europe Ltd Town Farm Bungalow North Curry Taunton Somerset U. K. TA3 6LX Telephone: 44 (0) 1823 491439 http://www.netclabels.co.uk
	NetC Asia Pacific Pty Ltd Locked Bag 14 Kenthurst NSW Australia 2156 Telephone: 61 (0) 2 9654 8272 http://www.netclabels.com.au

Chapter 6. Using the Fibre Channel Interface

Cables and Speeds

Ultrium 1 Tape Drives use SC duplex fiber optics cables; Ultrium 2 Tape Drives use LC duplex fiber optics cables.

The maximum distances that the Ultrium Scalable Tape Library supports on a Fibre Channel link is determined by the link speed, the type of fiber (50 micron or 62.5 micron), and the device to which the library is attached.

If the library attaches to an HBA, refer to the distances that are supported by the HBA. If the library attaches to a switch, the supported distances are:
- For a 50-micron cable:
  - 1-Gb link speed = up to 500 m (1640 ft)
  - 2-Gb link speed = up to 300 m (984 ft)
- For a 62.5-micron cable:
  - 1-Gb link speed = up to 175 m (574 ft)
  - 2-Gb link speed = up to 150 m (492 ft)

The Ultrium Scalable Tape Library uses 50-micron cables internally. Therefore, you must use a 50-micron cable to attach to the library's port. To attach to a 62.5-micron SAN, you must attach the 50-micron cable to an active port, such as a port on a switch.

Fibre Channel Addressing

Each Ultrium Tape Drive in an Ultrium Scalable Tape Library must have a Loop ID and corresponding Arbitrated Loop Physical Address (AL_PA) to communicate in a Fibre Channel topology. Table 25 lists the default Loop IDs and AL_PAs for each drive in the library.

Table 25. Default Loop IDs and their associated AL_PAs for Ultrium Tape Drives in the Ultrium Scalable Tape Library

Drive	Loop ID	AL_PA
1	0	X'EF'
2	1	X'E8'
3	2	X'E4'
4	3	X'E2'
5	4	X'E1'
6	5	X'E0'
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 TotalStorage Specialist web interface (see "Viewing or Changing a Loop ID" on page 169). 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 26 on page 269.

Table 26. Valid Loop IDs and their associated AL_PAs for Ultrium Tape Drives in the Ultrium Scalable 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

If you have the Multi-Path feature, the logical unit number (LUN) for the Sequential Access device is always LUN 0 of the drive, and the LUN for the Medium Changer device is always LUN 1 (all other LUNs are invalid addresses). These devices are compatible with the SCSI-2 or SCSI-3 standard. For information about the SCSI commands for the tape drive and the library, see the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference* and the *IBM TotalStorage Ultrium Scalable Tape Library 3583 SCSI Reference*.

Note: The Medium Changer SCSI ID is the same as the SCSI ID for Drive 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 "Partitioning the Library" on page 139 or "Adding or Removing Control Paths" on page 120).

Using World Wide Names

Normally, blocks of World Wide Name (WWN) addresses are assigned to manufacturers by the IEEE Standards Committee, and are built into devices during manufacture. In the case of the Ultrium Scalable Tape Library, however, the library assigns World Wide Node Names and World Wide Port Names to the drives. This technique is referred to as "persistent world wide names." Potential drive slots are each assigned a WWN which does not change when a drive is swapped or replaced.

The WWN of the drive is location-dependent and not device-dependent. That is, each time that the drive is reset or powered on, the library reestablishes the WWN so that a drive in Row x always keeps the same WWN, even if the drive is replaced. The design of a WWN is such that if a drive needs service or replacement, host parameters do not need to be changed or reconfigured. The library's configuration can also easily survive a reboot. The following sections describe methods that involve World Wide Names in resolving these issues.

Using Zoning to Isolate Devices and Enhance Security

For security reasons, it is important to limit the devices that a server or servers can recognize or access. Also, some performance configurations and SAN configurations can result in a device being seen multiple times from the same server. For example, if you have two HBAs from the same server connected to an Ultrium Tape Drive in the library, the drive will be detected and appear as two logical devices. That is, there will be two special files for one physical device. Zoning can address these issues.

Zoning allows you to partition your SAN into logical groupings of devices so that each group is isolated from the other and can only access the devices in its own group. Two types of zoning exist: hardware zoning and software zoning. Hardware zoning is based on physical fabric port number. Software zoning is defined with WWNN or WWPN. While zoning can be reconfigured without causing an outage, some zoning configurations can become complicated. The advantage of the library's WWNN implementation is that you can avoid the exposure of introducing zoning errors because you do not have to change the zoning configuration if a drive needs service or replacement.

Using Persistent Binding to Ensure SCSI ID Assignment

When a server is booted, devices are discovered and assigned SCSI target and LUN IDs. It is possible for these SCSI assignments to change between boots. Some operating systems do not guarantee that devices will always be allocated the same SCSI target ID after rebooting. Also, some software depends on this association, so you do not want it to change. The issue of SCSI ID assignment is addressed by persistent binding.

Persistent binding is an HBA function that allows a subset of discovered targets to be bound between a server and device. Implemented by a WWNN or WWPN, persistent binding causes a tape drive's WWN to be bound to a specific SCSI target ID. After a configuration has been set, it survives reboots and any hardware configuration changes because the information is preserved. If a drive needs to be replaced, the new drive assumes the WWNN of the old drive because the WWNN for the drive is location-dependent within the library. Because the WWNN does not change, persistent binding does not need to be changed which would cause an outage.

Connectors and Adapters

The Ultrium Scalable 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 supported attachments, visit the web at `http://www.ibm.com/storage/lto`. Select `LTO support`, then `Interoperability matrix and software (ISVs)`. Under `Supported servers and operating systems`, select `IBM TotalStorage Ultrium Scalable Tape Library 3583`. Or, contact your IBM Sales Representative.

Connecting to the iSeries Server

The iSeries does not require or allow you to set the Fibre Channel adapter settings. The adapter automatically detects the connection type and device addressing. OS/400 support is as follows:

- For V5R1, the adapter supports:
  - A single target with multiple LUNs
  - 1-Gb/s connection
  - For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
  - For a point-to-point topology, connection through an N_port (directly to device only)
  - Does not support fabric
- For V5R2, the adapter supports:
  - Up to 16 devices, including multiple targets and multiple LUNs (each LUN on each target counts as a device)
  - 2-Gb/s connection (but will negotiate down to 1 Gb/s if necessary)
  - For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
  - For a point-to-point topology, connection through an N_port to an F_port

The iSeries Fibre Channel adapter does not support D-mode Alternate IPL. The Alternate Installation function is used to restore a system from a Fibre Channel-attached device. With Alternate Installation support, the system is loaded

from a CD and directed to the Fibre Channel-attached device for a restore from the tape that contains the saved data. The code on the CD is only used to get the restore from tape started. All code and program temporary fixes (PTFs) are restored from the tape that contains the saved data.

Sharing on a Storage Area Network

With Storage Area Network (SAN) components, the possibilities for connecting multiple systems and multiple drives have increased. Not all software and systems are designed to share drives. Before you install a drive that would allow two systems to share it, check that the systems and their software support sharing. If your software does not support sharing, note that Fibre Channel switches have a zoning capability to form a SAN partition. For systems that do not cooperate, use zoning to prevent the systems from sharing the same drive. You can remove zoned partitions as you upgrade software and system levels.

Chapter 7. Using the SCSI Interface

Physical Characteristics of the SCSI Interface

The Ultrium Scalable Tape Library operates as a set of SCSI-2 or SCSI-3 devices. The Ultrium Tape Drives attach to servers as follows:

- Ultrium 2 Tape Drive uses LVD Ultra160 SCSI and HVD Ultra SCSI interfaces
- Ultrium 1 Tape Drive uses LVD Ultra2 SCSI and HVD Ultra SCSI interfaces

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

Note: The earlier version of the SCSI drive uses HD68 connectors. The HD68 drive is packaged on a tray (sled) and has been withdrawn from marketing. For more information, see Appendix E, "Feature Codes", on page 323.

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 276.

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 275), and IBM Ultrium Tape Drives must be the only target devices that are active on the bus.

Note: For maximum performance, the quantity of tape drives that you can attach to one SCSI bus is limited, and is based on the type of bus that you have and the amount of data compression achieved. Ultra SCSI buses have a bandwidth of 40 MB per second; Ultra2 SCSI buses have a bandwidth of 80 MB per second; Ultra160 SCSI buses have a bandwidth of 160 MB per second. Table 28 on page 274 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 Drive	Type of SCSI Bus			
	Fast/Wide	**Ultra**	**Ultra2**	**Ultra160**
HVD Ultrium 1 or 2 (for AS/400 or iSeries; see Note 1)	N/A (see Note 2)	1	N/A	N/A
LVD Ultrium 2	N/A	1	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)
LVD Ultrium 1	N/A	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)	4 (2 drives at 2:1 compression)

Notes:

1. If you are using an IBM AS/400 or IBM iSeries, you can attach only one HVD Ultrium 1 Tape Drive to the SCSI bus.

2. N/A = not applicable.

Default SCSI ID Assignments

Based on its physical position in the library, each tape drive 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 in the Ultrium Scalable Tape Library

Position	SCSI ID
Drive 1	0
Drive 2	1
Drive 3	2
Drive 4	3
Drive 5	4
Drive 6	5

> **Note:** You can change a SCSI ID by using the TotalStorage Specialist web interface or the operator panel. For more information, see "Viewing or Changing a Drive's SCSI ID" on page 166.

LUN Assignments for Ultrium Tape Drives

The logical unit number (LUN) for the Sequential Access device is always LUN 0 of the drive, and the LUN for the Medium Changer device is always LUN 1 (all other LUNs are invalid addresses). These devices are compatible with the SCSI-2 or SCSI-3 standard. For information about the SCSI commands for the tape drive and the library, see the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference* and the *IBM TotalStorage Ultrium Scalable Tape Library 3583 SCSI Reference*.

> **Note:** The Medium Changer SCSI ID is the same as the SCSI ID for Drive 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 "Partitioning the Library" on page 139 or "Adding or Removing Control Paths" on page 120).

Using Multiple SCSI Buses

The Ultrium Scalable 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 6 SCSI buses per library 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 19.

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.

SCSI Connectors and Adapters

The Ultrium Scalable 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 supported attachments, visit the web at `http://www.ibm.com/storage/lto`. Select `LTO support`, then `Interoperability matrix and software (ISVs)`. Under `Supported servers and operating systems`, select `IBM TotalStorage Ultrium Scalable Tape Library 3583`. Or, contact your IBM Sales Representative.

Notes on Connecting to the AS/400 and iSeries Servers

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

- An interposer (FC 2895 for the Ultrium Scalable Tape Library) is required to connect the library's tape drives to the Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only). No interposers are required to connect the library's tape drives to the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), or Magnetic Media Controller (FC 6534).
- The PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), and Magnetic Media Controller (FC 6534) provide one port.
- The Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only) provides two ports, but one port must remain unused when connecting the Ultrium Scalable Tape Library. Each port can support one or two of the library's tape drives, but only one is recommended for optimum performance.
- When the Ultrium Scalable Tape Library's tape drives are attached, no other devices can be supported on the ports for the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), or Magnetic Media Controller (FC 6534).
- An AS/400 or iSeries server cannot be interconnected with any other server (including another AS/400 or iSeries server) on the same SCSI bus.
- For the Ultrium Scalable 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 19).
- For the Ultrium Scalable 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 22).
- If you plan to use the Ultrium Scalable Tape Library as an alternate IPL device, you must set one of the SCSI addresses on its tape drives to 0 when you attach it with the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media

Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), Magnetic Media Controller (FC 6534), or 5702 adapter.

- Maximum performance by the Ultrium Tape Drive cannot be achieved with HVD SCSI. No increase in performance is expected by replacing HVD Ultrium Tape Drives with HVD Ultrium Tape Drives. Maximum performance can only be achieved with LVD SCSI or Fibre Channel attachment.

- LVD SCSI is supported with OS/2 V5R2 and the 5702 adapter. The 5702 uses Ultra160 SCSI technology and VHDCI cable connectors. Multiple Ultrium Tape Drives can be attached to one 5702 adapter, but performance must be taken into consideration. Each iSeries adapter must have at least one control path configured with the attached drives. The LVD Ultrium 1 Tape Drives are not supported.

- Multiple HVD SCSI Ultrium Tape Drives can be attached to the Magnetic Media Controller (FC 6534), PCI Magnetic Media Controller (FC 2729), or PCI Ultra Magnetic Media Controller (FC 2749) adapters, but performance must be taken into consideration. The HVD Ultrium 1 Tape Drive is limited to one drive per iSeries adapter. Each iSeries adapter must have at least one control path configured with the attached drives.

Appendix A. Removing a Tape Cartridge

If a tape cartridge fails to eject from an Ultrium Tape Drive in the Ultrium Scalable Tape Library, there are two methods to remove the cartridge. The following sections describe the two methods: resetting the drive and ejecting the cartridge, and manually removing the cartridge.

Resetting a Drive and Ejecting a Cartridge

If a tape cartridge fails to eject from an Ultrium Tape Drive, perform the following steps to reset the drive and eject the cartridge.

1. Use the server to set the library and drives Offline for all attached servers.
2. Open the front door of the library.
3. Locate the drive that contains the stuck tape cartridge. If the picker (**1** in Figure 390) is in front of the drive **2** , gently lift and hold the picker out of the way.
4. Press and release the unload button **5** on the front of the drive and wait for approximately 2 minutes. If the cartridge ejects, the procedure was successful. If the cartridge does not eject, continue with the next step.
5. Press and hold the unload button **5** until the single-character display **3** changes as the drive performs a power-on self test (POST). If the drive does not perform a POST within 15 seconds, cycle power to the library (turn it off, then on again).

   Note: If you raised the picker to access the tape drive, lower the picker before cycling power to the library.

6. After a reset or power cycle, the drive starts a slow rewind. During the slow rewind, the Activity light **4** flashes. Wait for the light to stop flashing (indicating that the slow rewind is complete). **This process may take up to 20 minutes.**
7. Press and release the unload button **5** and wait for approximately 2 minutes. If the cartridge ejects, the procedure was successful. If the cartridge does not eject, continue with the following procedure.
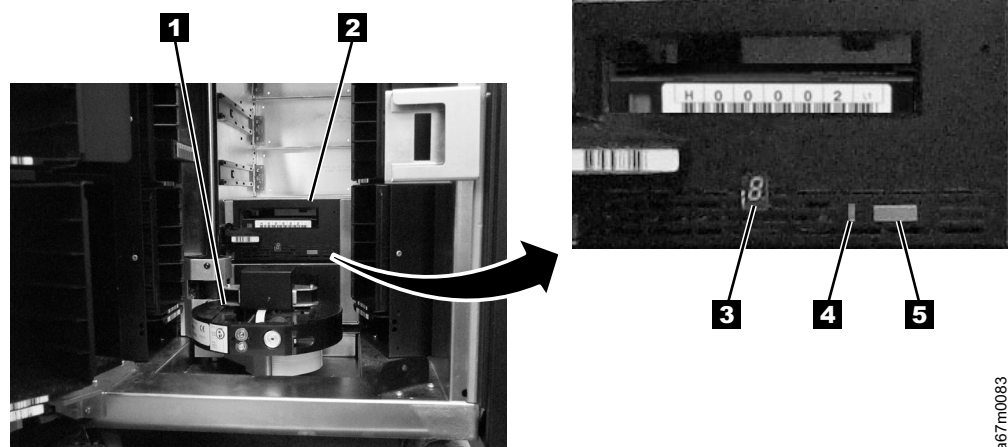
Figure 390. Resetting the tape drive

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Manually Removing the Cartridge

If problem-determination procedures identify the Ultrium Tape Drive as the source of a problem, you can optionally perform one of the following:

- Replace the entire unit. For more information, contact your OEM Product Application Engineer (PAE).
- Manually remove the cartridge (see "Removing the Cartridge").
- If you are unable to manually remove the cartridge, contact trained service personnel for assistance. Refer the service personnel to the instructions for fixing a jammed cartridge in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide.

> **Attention:**
> **If you are not a trained service person, do not attempt to open the drive for repairs. Attempting a repair other than the manual removal of a tape cartridge will void your warranty.**

Removing the Cartridge

If a tape cartridge fails to eject from an Ultrium Tape Drive, you can manually remove the cartridge. The following tools are required for the procedure:

- 2.5-mm allen wrench
- Small-blade screwdriver or potentiometer-setting tool
- 2-mm hex wrench
- #3 Phillips screwdriver
- Needle-nose pliers
- Flashlight (optional)

Attention: Before performing this procedure, note the following:

- Ensure that you have attempted all normal methods of removing the tape cartridge from the drive. Refer to "Resetting a Drive and Ejecting a Cartridge" on page 279.
- This procedure may damage the stuck tape cartridge. If you use this procedure, copy the data from the stuck cartridge to another cartridge. If you choose to reuse the stuck cartridge, refer to the instructions in "Repositioning or Reattaching a Leader Pin" on page 257. If you believe the cartridge has been damaged, replace it.
- Do not use a power screwdriver to perform this procedure because it can destroy the tape.
- Never touch the head or electronic components within the drive. Touching may cause contamination or damage by electrostatic discharge.

To manually remove a tape cartridge, perform the following steps:

1. Use the server to set the library and drives Offline for all attached servers.
2. From the operator panel, prepare the library for drive sled removal by selecting **Main Menu —> More —> Service —> Drives —> Repair —> Remove**.
3. Power-off the library by pushing O on the power switch.

4. Disconnect all cables to the drive sled that contains the stuck cartridge.
5. Loosen the two captive thumbscrews (see **1** in Figure 391) on the drive sled **2** and slide the drive sled out by using the handle **3** .
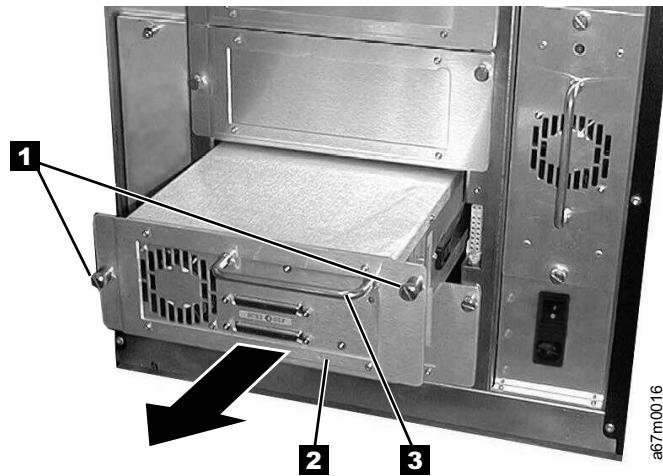
Figure 391. Removing the drive sled

6. Place the drive so that the front faces you, then tilt it on its left side (see Figure 392).
7. Locate the access hole at the bottom of the unit (see **1** in Figure 392).
8. Insert a 2.5-mm allen wrench into the access hole and position the wrench so that it is seated in the screw of the supply reel motor (not visible).
9. Push open the door of the tape load compartment and locate the flag **2** on the drive's takeup reel.
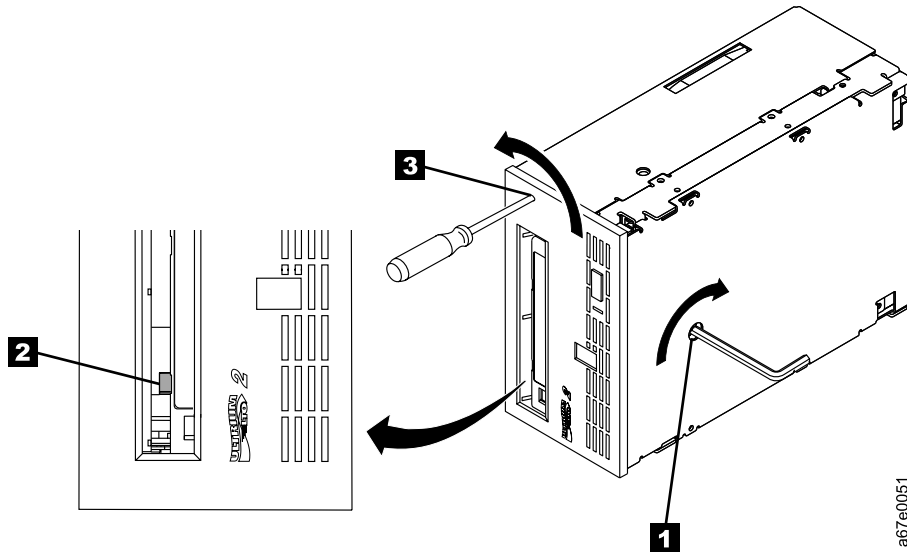
Figure 392. Determining whether the tape is broken. The view is from the front of the drive.

Attention: In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the tape.

10. To determine whether the tape is broken, watch the flag **2** on the drive's takeup reel while you rotate the allen wrench **1** clockwise (do not let the wrench move counterclockwise):
    - If you feel resistance to the allen wrench while attempting to turn the supply reel motor screw clockwise, go to step 12 on page 283.
    - If the takeup reel turns when you rotate the supply reel motor screw clockwise with the allen wrench, the tape is not broken. Go to step 11.
    - If the takeup reel does not turn when you rotate the supply reel motor screw clockwise with the allen wrench and if the supply reel motor screw rotates freely, the tape is broken. You must determine the location of the leader block. To do so, insert a small-blade screwdriver or potentiometer-setting tool into the access hole for the loader motor gear **3** . Rotate the screwdriver counterclockwise. You may have to rotate for a lengthy period:
        – If the cartridge moves up, the tape is completely in the cartridge and the leader block is in the home position. Continue rotating the screwdriver until the cartridge ejects. Remove the cartridge.
        – If you feel resistance and the cartridge does not move up, the leader block is not in the home position. Go to the procedure for fixing a jammed cartridge in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide.
11. Continue to rotate the allen wrench until you feel resistance. The tape has been rewound as far as it can go without unthreading.

Note: The number of required rotations depends on where the beginning of the tape is on the takeup reel. You may have to rotate the allen wrench for a lengthy period.

12. With the allen wrench still inserted into the bottom access hole, insert a small-blade screwdriver or potentiometer-setting tool into the access hole for the loader motor gear **3** (if it has not already been inserted).

13. While keeping torque on the supply reel motor screw and rotating the allen wrench **1** clockwise, rotate the loader motor gear with the small-blade screwdriver **3** counterclockwise (see arrow). As you rotate the screwdriver, the allen wrench moves slightly.

14. With the small-blade screwdriver continue to rotate the loader motor gear in the unload direction (counterclockwise).

    • If you feel no resistance to the allen wrench and the cartridge slowly moves up and out of the tape load compartment, the procedure was successful. Go to step 15.

    • If you feel resistance to the allen wrench and the cartridge does not move, the loader mechanism is jammed or the leader block is not at the home position. Remove the small-blade screwdriver and go to the procedure for fixing a jammed cartridge in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide.

15. Remove the tape cartridge.

16. Slide the drive sled into slot you removed it from using the handle **3** (see Figure 391 on page 281). Tighten the two captive thumbscrews **1** on the drive sled **2** .

17. Connect the SCSI cables that were disconnected in step 4 on page 281.

18. Power On the library by setting the Main Switch on the ac Input Power Module to the | position.

19. Refer to Table 34 on page 314 and run the Fast Read/Write Diagnostic (Function Code F).

After you remove the stuck tape cartridge, copy the data on the tape to another tape. Then, if appropriate, return the stuck tape cartridge in its original packaging or in the packaging from its replacement to your IBM-authorized distributor. If the leader pin detached from the tape in the cartridge during this procedure, go to "Repositioning or Reattaching a Leader Pin" on page 257.

Appendix B. Element Addressing

Note: The phrase `Windows 200x` in this appendix refers to both Microsoft Windows 2000 and Microsoft Windows 2003 operating systems.

All Operating Systems and Windows 200x with RSM Disabled

Element addressing in this section applies to all operating systems and Windows 200x that has the Remote Storage Manager (RSM) disabled.

Figure 393 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.

Single-Slot I/O Station Column 1

1 Slot Magazine →	10h (16)

Cartridge Storage Column 2

1 Fixed Slot →	Reserved
	1000h (4096)
	1001h (4097)
Magazine A →	1002h (4098)
	1003h (4099)
	1004h (4100)
	1005h (4101)
	1006h (4102)
	1007h (4103)
Magazine B →	1008h (4104)
	1009h (4105)
	100Ah (4106)
	100Bh (4107)
	100Ch (4108)
	100Dh (4109)
Magazine C →	100Eh (4110)
	100Fh (4111)
	1010h (4112)
	1011h (4113)

Columns Top View

Drive Column 3
Cartridge Storage Column 4
Cartridge Storage Column 2
Picker Assembly 1h (1)
I/O Station Column 1
Cartridge Storage Column 5

Drive Column 3

105h (261) ←	Drive Sled 6
104h (260) ←	Drive Sled 5
103h (259) ←	Drive Sled 4
102h (258) ←	Drive Sled 3
101h (257) ←	Drive Sled 2
100h (256) ←	Drive Sled 1

Cartridge Storage Column 4

Reserved	← 1 Fixed Slot →
1012h (4114)	
1013h (4115)	
1014h (4116)	Magazine A
1015h (4117)	
1016h (4118)	
1017h (4119)	
1018h (4120)	
1019h (4121)	
101Ah (4122)	Magazine B
101Bh (4123)	
101Ch (4124)	
101Dh (4125)	
101Eh (4126)	
101Fh (4127)	
1020h (4128)	Magazine C
1021h (4129)	
1022h (4130)	
1023h (4131)	

Cartridge Storage Column 5

Reserved
1024h (4132)
1025h (4133)
1026h (4134)
1027h (4135)
1028h (4136)
1029h (4137)
102Ah (4138)
102Bh (4139)
102Ch (4140)
102Dh (4141)
102Eh (4142)
102Fh (4143)
1030h (4144)
1031h (4145)
1032h (4146)
1033h (4147)
1034h (4148)
1035h (4149)

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Figure 393. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is disabled.

Figure 394 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.

Columns Top View

	Multiple-Slot I/O Station Column 1		Cartridge Storage Column 2
1 Fixed Slot →			Reserved
	10h (16)		1006h (4102)
	11h (17)		1007h (4103)
	12h (18)	Magazine A	1008h (4104)
	13h (19)		1009h (4105)
	14h (20)		100Ah (4106)
	15h (21)		100Bh (4107)
	16h (22)		100Ch (4108)
	17h (23)		100Dh (4109)
	18h (24)	Magazine B	100Eh (4110)
	19h (25)		100Fh (4111)
	1Ah (26)		1010h (4112)
	1Bh (27)		1011h (4113)
	1000h (4096)		1012h (4114)
	1001h (4097)		1013h (4115)
	1002h (4098)	Magazine C	1014h (4116)
	1003h (4099)		1015h (4117)
	1004h (4100)		1016h (4118)
	1005h (4101)		1017h (4119)

Drive Column 3		Cartridge Storage Column 4		Cartridge Storage Column 5
		Reserved	← 1 Fixed Slot →	Reserved
105h (261) ← Drive Sled 6		1018h (4120)		102Ah (4138)
		1019h (4121)		102Bh (4139)
		101Ah (4122)	Magazine A	102Ch (4140)
		101Bh (4123)		102Dh (4141)
104h (260) ← Drive Sled 5		101Ch (4124)		102Eh (4142)
		101Dh (4125)		102Fh (4143)
103h (259) ← Drive Sled 4		101Eh (4126)		1030h (4144)
		101Fh (4127)		1031h (4145)
		1020h (4128)	Magazine B	1032h (4146)
		1021h (4129)		1033h (4147)
102h (258) ← Drive Sled 3		1022h (4130)		1034h (4148)
		1023h (4131)		1035h (4149)
101h (257) ← Drive Sled 2		1024h (4132)		1036h (4150)
		1025h (4133)		1037h (4151)
		1026h (4134)	Magazine C	1038h (4152)
		1027h (4135)		1039h (4153)
100h (256) ← Drive Sled 1		1028h (4136)		103Ah (4154)
		1029h (4137)		103Bh (4155)

Picker Assembly 1h (1)

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Figure 394. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is disabled.

Figure 395 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

Multiple-Slot I/O Station Column 1		Cartridge Storage Column 2
	1 Fixed Slot →	Reserved
1000h (4096)		1012h (4114)
1001h (4097)		1013h (4115)
1002h (4098)	Magazine A	1014h (4116)
1003h (4099)		1015h (4117)
1004h (4100)		1016h (4118)
1005h (4101)		1017h (4119)
1006h (4102)		1018h (4120)
1007h (4103)		1019h (4121)
1008h (4104)	Magazine B	101Ah (4122)
1009h (4105)		101Bh (4123)
100Ah (4106)		101Ch (4124)
100Bh (4107)		101Dh (4125)
100Ch (4108)		101Eh (4126)
100Dh (4109)		101Fh (4127)
100Eh (4110)	Magazine C	1020h (4128)
100Fh (4111)		1021h (4129)
1010h (4112)		1022h (4130)
1011h (4113)		1023h (4131)

Columns Top View

Drive Column 3

Picker Assembly 1h (1)

Cartridge Storage Column 2

Cartridge Storage Column 4

I/O Station Column 1

Cartridge Storage Column 5

Drive Column 3		Cartridge Storage Column 4		Cartridge Storage Column 5
		Reserved	← 1 Fixed Slot →	Reserved
105h (261) ← Drive Sled 6		1024h (4132)		1036h (4150)
		1025h (4133)		1037h (4151)
		1026h (4134)	Magazine A	1038h (4152)
		1027h (4135)		1039h (4153)
104h (260) ← Drive Sled 5		1028h (4136)		103Ah (4154)
		1029h (4137)		103Bh (4155)
103h (259) ← Drive Sled 4		102Ah (4138)		103Ch (4156)
		102Bh (4139)		103Dh (4157)
		102Ch (4140)	Magazine B	103Eh (4158)
		102Dh (4141)		103Fh (4159)
102h (258) ← Drive Sled 3		102Eh (4142)		1040h (4160)
		102Fh (4143)		1041h (4161)
101h (257) ← Drive Sled 2		1030h (4144)		1042h (4162)
		1031h (4145)		1043h (4163)
		1032h (4146)	Magazine C	1044h (4164)
		1033h (4147)		1045h (4165)
100h (256) ← Drive Sled 1		1034h (4148)		1046h (4166)
		1035h (4149)		1047h (4167)

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Figure 395. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is disabled.

Windows 200x with RSM Enabled

Element addressing in this section applies to the Windows 200x operating system that has the Remote Storage Manager (RSM) enabled.

Figure 396 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.
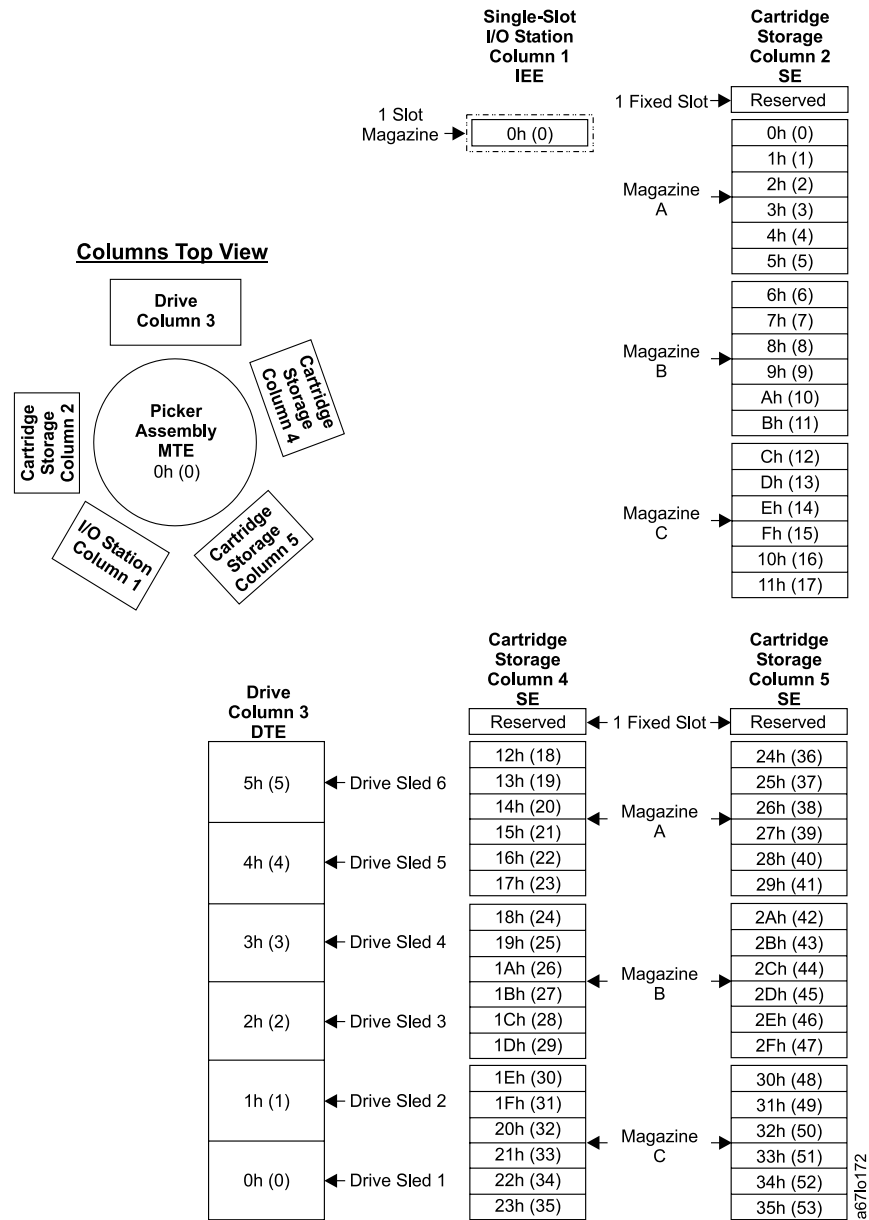
Figure 396. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is enabled.

Figure 397 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.
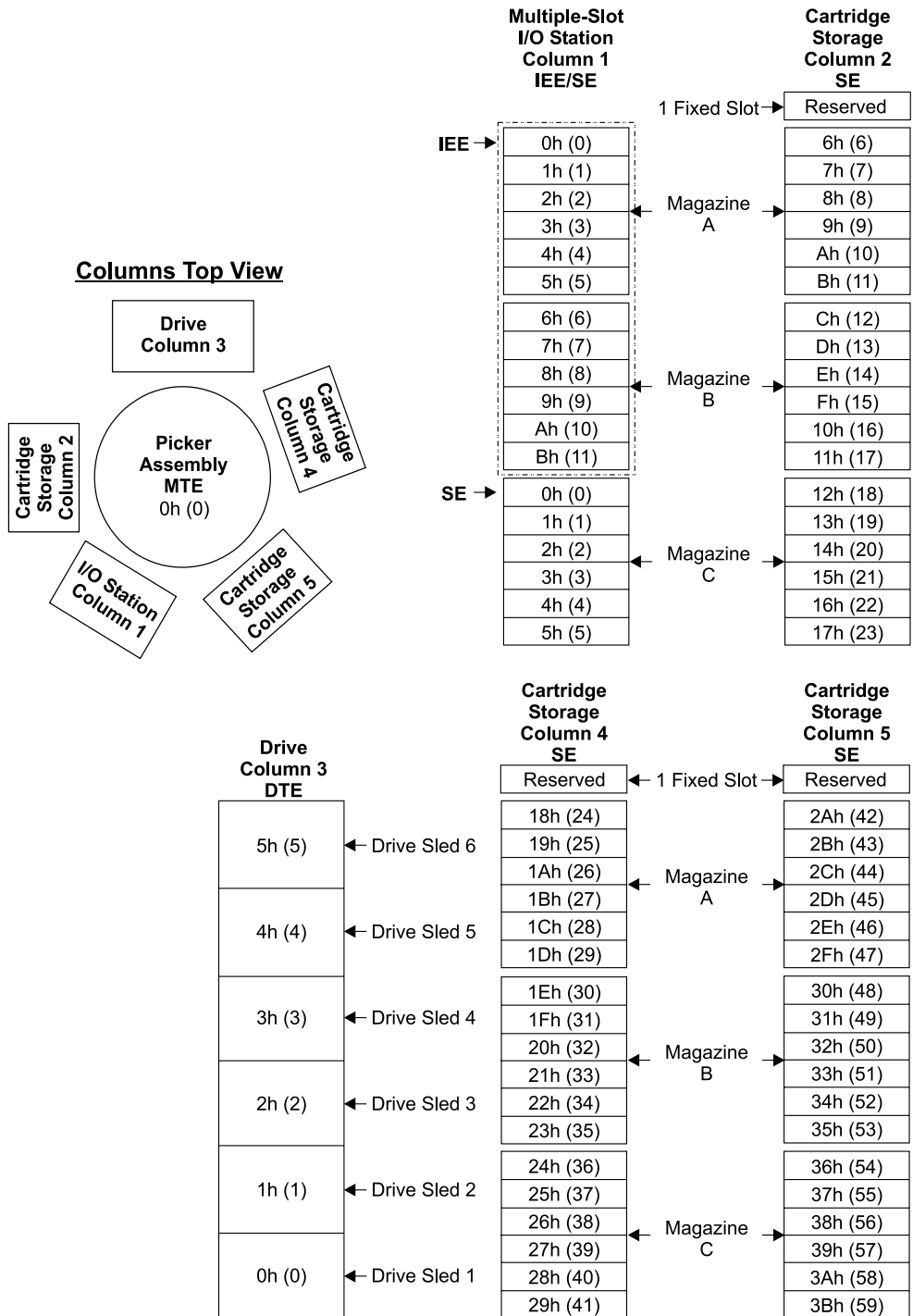
Figure 397. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is enabled.

Figure 398 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

Multiple-Slot I/O Station Column 1 SE		Cartridge Storage Column 2 SE
	1 Fixed Slot →	Reserved
0h (0)		12h (18)
1h (1)		13h (19)
2h (2)	Magazine A	14h (20)
3h (3)		15h (21)
4h (4)		16h (22)
5h (5)		17h (23)
6h (6)		18h (24)
7h (7)		19h (25)
8h (8)	Magazine B	1Ah (26)
9h (9)		1Bh (27)
Ah (10)		1Ch (28)
Bh (11)		1Dh (29)
Ch (12)		1Eh (30)
Dh (13)		1Fh (31)
Eh (14)	Magazine C	20h (32)
Fh (15)		21h (33)
10h (16)		22h (34)
11h (17)		23h (35)

Columns Top View

Drive Column 3

Cartridge Storage Column 2

Picker Assembly MTE 0h (0)

Cartridge Storage Column 4

I/O Station Column 1

Cartridge Storage Column 5

Drive Column 3 DTE		Cartridge Storage Column 4 SE		Cartridge Storage Column 5 SE
		Reserved ← 1 Fixed Slot →		Reserved
5h (5) ← Drive Sled 6		24h (36)		36h (54)
		25h (37)		37h (55)
		26h (38)	Magazine A	38h (56)
		27h (39)		39h (57)
4h (4) ← Drive Sled 5		28h (40)		3Ah (58)
		29h (41)		3Bh (59)
3h (3) ← Drive Sled 4		2Ah (42)		3Ch (60)
		2Bh (43)		3Dh (61)
		2Ch (44)	Magazine B	3Eh (62)
		2Dh (45)		3Fh (63)
2h (2) ← Drive Sled 3		2Eh (46)		40h (64)
		2Fh (47)		41h (65)
1h (1) ← Drive Sled 2		30h (48)		42h (66)
		31h (49)		43h (67)
		32h (50)	Magazine C	44h (68)
		33h (51)		45h (69)
0h (0) ← Drive Sled 1		34h (52)		46h (70)
		35h (53)		47h (71)

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Figure 398. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is enabled.

Appendix C. TapeAlert Flags

TapeAlert is a standard that defines status conditions and problems experienced by devices such as tape drives, autoloaders, and libraries. The standard enables a server to read TapeAlert messages (called *flags*) from a tape drive via the SCSI bus. The server reads the flags from Log Sense Page 0x2E.

The IBM TotalStorage Ultrium Scalable Tape Library 3583 is compatible with TapeAlert technology, which provides error and diagnostic information about the drives and the library to the server.

This appendix lists the TapeAlert flags that are supported by the Ultrium Tape Drive and the IBM TotalStorage Ultrium Scalable Tape Library 3583.

TapeAlert Flags Supported by the 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, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 in Table 33 on page 310.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see "Setting the Write-Protect Switch" on page 250). If Flag Number 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 in Table 33 on page 310.
8	Not data grade	Set when the cartridge is not data-grade. Any data that you write to the tape is at risk.	Replace the tape with a data-grade tape.
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 250).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server's operating system.

TapeAlert Flags Supported by the Ultrium Tape Drive			
Flag Number	**Flag**	**Description**	**Action Required**
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.
14	Unrecoverable snapped tape	Set when the tape split apart.	Do not attempt to extract the old tape cartridge. Call the tape drive supplier's help line.
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the tape cartridge. If this error occurs on multiple cartridges, see Error Code 6 in Table 33 on page 310.
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read all data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive (see "Cleaning Drives" on page 244).
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon. See "Cleaning Drives" on page 244.
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs that requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see Table 33 on page 310 for the appropriate instructions.
31	Hardware B	Set when the tape drive fails its internal Power-On Self Tests.	Note the error code on the single-character display and see Table 33 on page 310 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI, Fibre Channel, or RS-422 interface.	Locate Error Code 8 or 9 in Table 33 on page 310.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive.	Unload the tape cartridge, then reinsert it and restart the operation.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive through the SCSI or Fibre Channel interface.	Ensure that it is the correct FMR image. Download the FMR image again.

TapeAlert Flags Supported by the Ultrium Tape Drive			
Flag Number	Flag	Description	Action Required
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the library.	See Error Code 1 in Table 33 on page 310.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are either approaching the specified voltage limits or are outside the voltage limits (see Table 6 on page 27).	See Error Code 2 in Table 33 on page 310.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	See Error Code 6 in Table 33 on page 310.
51	Tape directory invalid at unload	Set when the tape directory on the tape cartridge that was previously unloaded is corrupted. The file-search performance is degraded.	Use your backup software to rebuild the tape directory by reading all the data.
52	Tape system area write failure	Set when the tape cartridge that was previously unloaded could not write its system area successfully.	Copy the data to another tape cartridge, then discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at load time.	Copy the data to another tape cartridge, then discard the old cartridge.

TapeAlert Flags Supported by the Library

TapeAlert Flags Supported by the IBM TotalStorage Ultrium Scalable Tape Library 3583			
Flag Number	Flag	Description	Action Required
1	Library hardware A	The library has trouble communicating with the drive.	Restart the operation.
2	Library hardware B	The library has a hardware failure.	Restart the operation.
4	Library hardware D	The library has a hardware fault that is not mechanically related.	Restart the operation.
7	Predictive failure	Predictive failure of library hardware.	Contact IBM Technical Support
8	Library maintenance	Library Preventive Maintenance required.	Contact IBM Technical Support
13	Library pick retry	The operation to pick a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
14	Library place retry	The operation to place a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
15	Library load retry	The operation to load a cartridge into a drive had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
16	Library door	A library door is open and prevents the library from functioning.	Close the library door.

TapeAlert Flags Supported by the IBM TotalStorage Ultrium Scalable Tape Library 3583			
Flag Number	**Flag**	**Description**	**Action Required**
17	Library I/O station	A problem exists with the I/O station.	1. Ensure that there is no obstruction in the I/O station. 2. Restart the operation.
19	Library security	Library door opened then closed during operation.	Library security has been compromised.
20	Library security mode	Library security mode changed.	The security mode of the library has been changed. For information purposes only. No action required.
21	Library offline	Library manually turned offline.	The library has been manually turned offline and is unavailable for use.
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 reader hardware in the library mechanism.	Check for damaged, misaligned, or peeling bar code labels on cartridges.
24	Library inventory	An inventory of the media was inconsistent.	1. Run a library inventory to correct the inconsistency. 2. Restart the operation.
28	Power supply	A redundant power supply failure exists inside the library.	Contact your IBM Technical Support.
32	Unreadable bar code label	During an inventory or scan, the library was unable to read a bar code label on a cartridge.	Check for damaged, misaligned, or peeling bar code labels on the cartridge.

Appendix D. Error Messages

When a failure occurs, the Ultrium Scalable Tape Library firmware performs error recovery and posts codes and messages to the operator panel. If the failure requires service, the library posts Service Action Codes (SACs) (see Table 30). If the failure requires operator intervention, the library posts a message (see Table 31 on page 305). The library also posts information messages that relate to the current operation (see "Operator Information Messages" on page 309).

Service Action Codes

Table 30 lists the SACs and the corresponding actions that can be performed by an operator. Each SAC consists of 2 bytes, nn xx, where:

nn = SAC

xx = SAC modifier. This byte is normally 00 and can be ignored, except where the action listed specifies that the modifier is to be used to select a particular procedure.

Table 30. Service Action Codes (SAC)

Reported SAC	Type of Error	Perform These Actions
01 xx	Type 1 Software errors, including microcode and operating system errors.	To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
02 xx	Type 2 Software errors, including microcode logic and operating system errors.	To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
03 xx	Type 3 Software errors, including microcode logic and operating system errors.	To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
04 xx	Type 4 Software errors (Inter Processor), including microcode and operating system errors.	To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
05 xx	Permanent operating system error.	To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
10 xx	Bar code reader communications failed.	1. Clean the bar code reader (see "Cleaning the Bar Code Reader" on page 255). 2. Retry the failing operation. 3. To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
11 xx	Bar code reader communication is OK. Data received from the bar code reader is bad.	1. Clean the bar code reader (see "Cleaning the Bar Code Reader" on page 255). 2. Ensure that the bar code label meets specifications (see "Bar Code Label" on page 248).
12 00	Bar code reader communication is OK. Bar code reader reports that data is bad.	Clean the bar code reader (see "Cleaning the Bar Code Reader" on page 255).

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
13 xx	Cannot read bar code label or the label is bad.	1. Ensure that the bar code label meets specifications (see "Bar Code Label" on page 248). The cartridge slots in question are displayed with the Service Action Code. 2. Ensure that scan beam is not obstructed. 3. Clean the bar code reader (see "Cleaning the Bar Code Reader" on page 255). 4. Retry the failing operation. 5. To recover from the error, power the tape library off, wait several seconds, then power it on again. Use the main switch to perform this action.
14 xx	The system detects that the serial number is missing from its Non-Volatile Random Access Memory (NVRAM).	Record and reenter the system serial number (by using the serial cable and HyperTerminal). Enter the `setser` command from the HyperTerminal prompt.
15 xx	The bar code reader is not capable of fully supporting all of the different labels in the library.	Ensure that the bar code label meets specifications (see "Bar Code Label" on page 248). The cartridge slots in question are displayed with the Service Action Code.
20 00	Serial port connection failures.	See "Updating Library Firmware by Using the Library's Serial Port" on page 241. The problem could be in the host system.
21 xx	NVRAM failures.	Service is required. Contact your Service Representative.
22 00	Operator panel communication failure.	Service is required. Contact your Service Representative.
23 00	Unexpected interrupt.	Service is required. Contact your Service Representative.
30 00 31 00	Fatal error in SCSI port.	1. Verify that the SCSI-bus-to-library connection is properly terminated and powered. 2. Verify that the library's SCSI ID is properly set (see "Step 9. Setting the SCSI and Loop IDs" on page 74).
32 00 33 00	Wrong SCSI bus connection. A single-ended SCSI bus is connected to the library port differential adapter.	Verify that the host's (server's) SCSI bus is the same type as the library's SCSI host interface board.
34 00	General SCSI failure.	Verify that the SCSI host (server) is working properly.
35 00	Fatal SCSI error.	1. Verify that the SCSI bus connection is properly terminated and powered. 2. Verify that the library's SCSI ID is properly set (see "Step 9. Setting the SCSI and Loop IDs" on page 74).
38 xx	RMU cannot communicate with the DHCP server.	1. Ensure that the network cable is properly connected to the RMU and verify that the RMU is set up to work in DHCP mode (Main Menu —>Setup —>Library —>RMU). 2. Verify that the DHCP server is properly set up and configured. Test whether the DHCP server can ping the RMU (see "Step 7. Configuring the RMU" on page 70).
39 xx	External network error detected by the RMU.	1. Ensure that the network cable is properly connected to the RMU (see "Step 7. Configuring the RMU" on page 70). 2. Verify that the network the RMU is connected to is working properly.

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
40 xx	Servo power missing.	Service is required. Contact your Service Representative.
42 xx	Wrong library configuration (the I/O station column is missing or the drive sleds are not installed in the allowable configurations).	1. Ensure that the I/O station is installed. Ensure that the fiducial label is properly installed and not damaged. The fiducial label is present on both the single-slot I/O station and the multiple-slot I/O station. 2. Ensure that the drive sleds are installed properly (see "Installing a Drive Sled" on page 50). Drive sled 1 must be installed in the bottom slot of the drive column. If you have a library with the Multi-Path feature, see the section about partitioning in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide* Additional drive sleds must be installed consecutively, one above the other, with no gaps.
43 xx	Unknown library configuration detected. The bar code reader reads a fiducial label where none is expected.	1. Ensure that the firmware level in the library supports the hardware installed (see "Viewing the Library's Serial Number and Firmware Level" on page 230). 2. If you are unable to determine the defective part, perform a serial trace (see the section about capturing the serial logs in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*). 3. Check for a dirty, damaged, missing, or wrong fiducial label located on the storage columns, magazines, or drive sleds in the library and replace the part that is defective.
44 xx	Unknown fiducial label detected during a Teach operation.	1. Ensure that the firmware level in the library supports the hardware installed (see "Viewing the Library's Serial Number and Firmware Level" on page 230). 2. If you are unable to determine the defective part, perform a serial trace (see the section about capturing the serial logs in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*). 3. Check for a dirty, damaged, missing, or wrong fiducial label where the picker is positioned.

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions

46 xx	Failure detected during the scanning of fiducial or cartridge labels. This failure can have a variety of causes.	1. Clean the bar code reader (see "Cleaning the Bar Code Reader" on page 255).
		
		2. Check for a dirty, damaged, missing, or wrong fiducial label on the magazine. To isolate the problem magazine, perform one of the following procedures:
		
		  • Note the number of magazines that are installed in the library (at least one cartridge should be in each magazine) and use the operator panel to compare this information with the number of magazines reported by the library. If the library is equipped with a 12-slot I/O station, the icons that represent the magazines in the I/O station column are displayed in the I/O station area.
		
		  • Remove one magazine at a time and retry the operation until the problem is resolved (Main Menu —>Status —>Library —> System or Slot).
		
		  Replace the failing magazine, if found.
		
		3. Check for a dirty, damaged, or incorrect cartridge bar code label. To isolate the problem label, perform one of the following procedures:
		
		  • Note the number of cartridges that are installed in the library and use the operator panel to compare this information with the number of cartridges reported by the library.
		
		  • Remove a few cartridges at a time and retry the operation until the problem is resolved. (Main Menu —>Status —>Library —> System or Slot).
		
		  Replace the faulty bar code label on the cartridge.

50 00	A cartridge is not properly seated in the storage slot.	1. Ensure that the cartridge in question is properly installed in its storage slot. The slots in question are displayed with the Service Action Code. 2. Check the cartridge label to ensure that it meets specifications, is installed properly, and is not damaged or dirty. 3. Reteach (calibrate) the library (see "Calibrating the Library" on page 221).
60 xx	Cannot complete the Lock/Unlock I/O station commands.	Run Lock Diagnostics from the operator panel to see if there are any mechanical bindings (see "Checking the Sensors and Locking or Unlocking of the I/O Station Door" on page 192).
61 00	I/O station's closed sensor error threshold is exceeded.	Service is required. Contact your Service Representative.
70 xx	Failures in picker assembly grip finger open operation.	Run grip finger diagnostics (see "Checking the Movement of the Picker" on page 204).
71 xx	Failures detected in picker assembly grip finger close operation.	Run grip finger diagnostics (see "Checking the Movement of the Picker" on page 204).
72 xx	A Get command was issued, but the sensor indicated that a cartridge is already present in the picker assembly.	Look into the picker assembly and see if a cartridge is present. If a cartridge is found in the picker, recover the cartridge and place it in any empty slot, close the door, and retry the failing operation.

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
73 xx	Failures in picker assembly finger open/close operations.	Service is required. Contact your Service Representative.
74 00	A Get command was issued but the sensor indicated that the source location is empty.	1. This error can be caused by a cartridge that is not fully inserted in the storage slot above the failing slot. If this condition exists, push the cartridge into its slot and close the library door. 2. Reteach (calibrate) the library (see "Calibrating the Library" on page 221).
75 00	Failure in picker assembly.	Service is required. Contact your Service Representative.
76 00	Teach failure caused by picker out of alignment.	Service is required. Contact your Service Representative.
77 xx	Failures in picker assembly during a retract operation.	Service is required. Contact your Service Representative.
78 xx	A Put command was issued but the sensor indicated that the cartridge is not present in the picker assembly.	Service is required. Contact your Service Representative.
79 xx	Failures detected in putting a cartridge into a tape drive.	Ensure that the tape drive sled is properly seated, powered on, and working properly.
7A xx	Failures detected in the picker assembly Reach/Retract operations.	Tape and magazine problems can cause this error. Check for obstructions in the picker path, such as a cartridge not fully inserted in a storage slot or drive. If the slot wall in the magazine is too tight, replace the magazine.
7C xx	Failures detected in the picker assembly Reach operation.	Check for obstruction in the slot. Obstruction can be in the form of: • An unlabeled cartridge • A cartridge in the slot during a Put operation • The slot wall in the magazine is too tight Remove the obstruction or replace the magazine, close the door, and retry the failing operation.
7D xx	Failure detected while getting a cartridge from a tape drive.	Check the tape drive and see if a cartridge is present. If a cartridge is found in the tape drive, remove the cartridge from the tape drive, power-on the drive, and retry the operation.
7E xx	Failure detected while pushing a cartridge into a tape drive feed slot.	1. Check the cartridge for any physical damage. 2. Replace the failing drive sled.
80 xx	Failures detected in the rotary-axis servo system.	Service is required. Contact your Service Representative.
81 xx	Failures detected in the Y-axis servo system.	Tape and magazine problems can cause this error. Check for obstructions in the picker's path, such as a tape not fully inserted in a storage slot. If the slot wall in the magazine is too tight, replace the magazine.
82 xx	Unexpected motion control condition received.	Service is required. Contact your Service Representative.
83 xx	The Locate Fiducial command failed with no target found. This failure is most likely to occur during an initial installation of the library.	1. Ensure that all fiducial labels are present and meet specifications. 2. Clean all teach fiducial labels.
84 xx	Y-axis failed to reach target.	Check for mechanical binding in Y-axis.

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
85 xx	Rotary axis failed to reach target.	Check for mechanical binding in rotary-axis.
86 00	The first full-speed move command issued when the picker is at home position failed.	Check for mechanical binding in both rotary and Y-axis.
87 00	Picker cannot move away from rotary axis home position.	Service is required. Contact your Service Representative.
88 00	Picker cannot move away from Y-axis home position.	Service is required. Contact your Service Representative.
89 xx	Failure while communicating with motion controllers.	Service is required. Contact your Service Representative.
8A xx	Returned sense indicated that a motion command completed sooner than expected.	Check the Y-axis for binding. Binding can be caused by an object that prevents the Y-axis from homing and reaching its target correctly.
8B xx	Servo failures in rotary or reach axes, or both.	Service is required. Contact your Service Representative.
90 00	Down-level main controller board detected by library firmware when a new board is required for this library configuration to operate.	Service is required. Contact your Service Representative.
91 00	Down-level picker control board detected by library firmware when a new board is required for this library configuration to operate.	Service is required. Contact your Service Representative.
92 xx	Down-level board detected by library firmware when a new board is required for this library configuration to operate.	Service is required. Contact your Service Representative.
93 xx	Failure detected in drive communication hardware within the library; the library cannot communicate with one or more drives (check the SAC message for the physical location of the failing drive).	Observe the message that accompanies the SAC. If it indicates that the library cannot communicate with one specific tape drive: • Ensure that the drive sled is properly installed in the drive slot. • Replace the failing drive sled.
94 xx	Communication previously established but no longer present between library and the tape drive, or drive status is not as expected.	Ensure that the failing drive sled is properly installed and powered on. Check for a cartridge in the failing tape drive that prevents the drive from becoming ready. If a cartridge is present, eject the cartridge and retry the operation. If the operation continues to fail, replace the drive sled.
95 xx	Picker assembly delivered cartridge to drive but drive does not confirm tape loading status. The xx part of the SAC identifies the drive.	Retry the operation by manually loading a cartridge into the tape drive. Replace the failing drive sled if this operation failed.
98 xx	Firmware on drive is not supported by the library. The xx part of the SAC identifies the drive.	Update the drive firmware with the latest level (see "Updating Firmware" on page 235).
A0 xx	Communication not established between main controller board and RMU.	Ensure that the RMU is properly installed and configured (see "Step 7. Configuring the RMU" on page 70).

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
A1 xx	Communication between main controller board and one of the auxiliary controller boards in the library was initially established but has been lost.	Service is required. Contact your Service Representative.
A2 xx	Communication between main controller board and picker control board was initially established but has been lost.	Service is required. Contact your Service Representative.
A3 xx	Communication between main controller board and display control board was initially established but has been lost.	Service is required. Contact your Service Representative.
D0 xx	One of the dc power supplies failed. This condition only occurs in libraries equipped with the redundant dc power supply feature.	Observe the LEDs located on each dc power supply. The LED should be green or red. Red LED indicates the power supply has failed. Replace the failing power supply.
D1 xx	ac input to one bank of the dc power supplies is missing. This condition only occurs in libraries equipped with the redundant dc power supply feature.	Observe the LEDs located on each dc power supply. The LED should be green or red. Red LED indicates the power supply has failed. Replace the failing power supply.
D2 xx	Fan failed in one of the dc power supplies, or the power supplies are not at the same power architecture level.	• If the library has only one dc power supply, replace the dc power supply. • If the library has two dc power supplies, the failing supply will display a red LED. Replace the power supply that has the red LED (see "Installing a Redundant dc Power Supply" on page 52).
E0 xx	Cartridge stuck in picker assembly.	Remove the cartridge from the grip fingers.
E1 xx	I/O station door not fully closed.	Close the door of the I/O station.
E2 xx	Front door not fully closed.	Close the front door.
E3 00 E4 00	Wrong SCSI bus connection. A single-ended SCSI device is connected to the library, which is configured in differential mode.	Check the library configuration to ensure that all devices on the library-s SCSI port have the same SCSI type.
E5 00 E6 00	SCSI bus connected to library port is not properly terminated.	Ensure that both ends of the SCSI bus connected to the library port are properly terminated. A terminator is shipped with each SCSI host interface board.
E7 xx	Picker assembly detected that a cartridge is not present in the grip fingers. The cartridge may not be seated properly in the grip fingers or the Get operation is not successful.	1. Locate the cartridge in question. 2. If the cartridge is not properly seated in the grip fingers, remove the cartridge, insert it in any empty slot, and retry the operation. 3. If the cartridge is not in the picker but located in its original slot, the cartridge may be seated too tightly in the slot. Replace the magazine, perform an inventory, and retry the operation.
E8 xx	During a put cartridge after a successful Get command, the picker assembly detected that the cartridge is no longer present in the grip fingers.	1. Locate the missing cartridge. 2. If a cartridge is found, recover the cartridge, re-inventory the library and retry the operation.

Table 30. Service Action Codes (SAC) (continued)

Reported SAC	Type of Error	Perform These Actions
EA 00	Failures while running diagnostic loop test from main controller board to all sensors on the I/O Station.	Service is required. Contact your Service Representative.
F0 00	Failures while running diagnostic loop test from main controller board to picker control board.	Service is required. Contact your Service Representative.
F1 00	Failures while running diagnostic loop test from main controller board to display control board.	Service is required. Contact your Service Representative.
F7 00	Failures in main controller board during Power-On Self Test.	Service is required. Contact your Service Representative.
F8 00	Failures in picker control board during Power-On Self Test.	Service is required. Contact your Service Representative.
F9 00	Failures in display control board during Power-On Self Test.	Service is required. Contact your Service Representative.
FA 00	Failures in SCSI host interface board during Power-On Self Test.	Service is required. Contact your Service Representative.
FB 00	Preventive maintenance.	1. Press OK on the operator panel to clear the SAC. 2. Ensure that the library firmware is at the latest level (see "Updating Firmware" on page 235).

Operator Intervention Messages

Table 31 describes the operator intervention messages. Each intervention message is composed of four lines. The third or fourth, or both, lines may contain variable information specific to the message. To determine the meaning of the SAC (in the Message Lines column), see Table 30 on page 297. Codes that contain error modifiers (in the Variables column) are for Engineering use only.

Table 31. Operator intervention messages

Message Lines	Variables
Alert not found. Press OK.	None
-=>ERROR!<=- Initialization Error Code: 0x%Y	%Y = 4-digit error modifier
-=>PERM ERROR!<=- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
-=>PERM ERROR!<=- SYSTEM WILL REBOOT SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->SYSTEM REBOOTED<- NEW CODE LOADED Version %X.%YY.%ZZZZ	current version %X = 1-digit major rev %Y = 2-digit minor rev %Z = 4-digit minor rev
->SYSTEM REBOOTED<- RECOVERED FROM ERROR SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->SYSTEM REBOOTED<- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->TOO MANY ERRORS!<- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
INTERVENTION NEEDED! Close the I/O station to complete the action.	None
INTERVENTION NEEDED! Unexpected door open detected. Make sure the door is closed.	None
INTERVENTION NEEDED! Single-ended device detected on this Differential bus.	None
INTERVENTION NEEDED! Check SCSI bus port 0 connector and/or termination.	None
INTERVENTION NEEDED! Remove cartridge in picker and return to storage.	None

Table 31. Operator intervention messages (continued)

Message Lines	Variables
BAD MEDIA Cannot get type. Please label media. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
INTERVENTION NEEDED! Remove cartridge from slot. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
UPSIDE DOWN MEDIA Ensure cartridge is in slot properly. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
SLOT IS OBSTRUCTED Please check to see if slot is empty. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
SLOT IS EMPTY Please check to see if slot is full. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
DRIVE COMM FAILED Please verify drive communication path. Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE SCSI ID FAILED Please verify drive SCSI id setting for Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
TAPE PUSH FAILED Please remove tape from drive. Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE INIT FAILED Please correct drive initialization for Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE CLEAN FAILED A cleaning operation failed to clean Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
INVALID LABEL Please check media for valid label Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
DUPLICATE LABEL Please check volsers at element address %X and %Y	%X = element address %Y = element address The screen message [0 @ 0] indicates that the cartridge is on the picker assembly
SER NUMBER MISSING Please enter the system serial number via the monitor.	None

Table 31. Operator intervention messages (continued)

Message Lines	Variables
One or more drives has downlevel firmware. You may wish to update these drives. See your user documentation.	None
Your library firmware versions do not match. Download the latest version to the library.	None
The Use-Count must be less than the Max-Count. Value Range: 0-99.	None
Autoclean is disabled. Access is denied. Use autoclean's Setup menu to enable.	None
No fixed cleaning slots installed. Autoclean access is denied.	None
You are changing the I/O configuration. Autoclean will automatically be disabled.	None
CLEAN TAPE MISSING A previously defined tape is missing: %X	%X = cartridge number
CLEAN TAPE EXPIRED Please remove the cleaning tape number %X	%X = cartridge number
No cleaning tape in cleaning slot %X Write down data. Will remove record. Use-Count: %Y Max-Count: %Z	%X = cartridge number %Y = use-count number %Y = max-count number
Cleaning Power-Out Recovery failed for slot %X. Write down data and remove tape. Use-Count: %Y Max-Count: %Z	%X = slot number %Y = use-count number %Y = max-count number

Table 31. Operator intervention messages (continued)

Message Lines	Variables
No record for existing- ing cleaning tape. Remove cleaning tape from slot %X manually and insert it via the front panel.	%X = slot number
Cleaning tape %X has expired. Export the cleaning tape via the front panel. See your user documentation.	%X = cartridge number
Your cleaning tapes are expired or not in the system. Please import a new cleaning tape.	None
%X of cleaning tape failed. Tape should not be in target position	%X = Import or Export
There is no cleaning slot available for importing new cleaning tapes.	None
Invalid cleaning tape inserted.	None
WARNING - There are no cleaning tapes available in any of your cleaning cells to perform cleaning.	None
There is no clean- ing tape available in cleaning call %X to perform cleaning.	%X = slot number
There is no cleaning slot available for importing new cleaning tapes cleaning tapes.	None
There is no tape in [1 A 1]. Please insert a cleaning tape and retry import	None
I/O station is configured as storage. Autoclean may not be enabled.	None

Table 31. Operator intervention messages (continued)

Message Lines	Variables
Partition is not accessible. Library configuration has changed.	None

Operator Information Messages

Table 32 lists the operator information messages.

Table 32. Operator information messages

Message Lines	Variables
INITIALIZING	None
OFFLINE	None
ONLINE	None
HOMING PICKER	None
TEACHING COLUMN [%X]	%X = column number
SCANNING COLUMN [%X]	%X = column number
INITIALIZING DRIVES	None
GOING READY	None
DOOR IS OPEN	None
PICKER HOME FAIL	None
PICKER NOT HOME	None
GOING ONLINE	None
GOING OFFLINE	None
–=>ERROR!<=-	None
REBOOTING	None
CARTRIDGE RECOVERY	None
CARTRIDGE IN PICKER	None
SELF TEST FAILED	None

Drive Error Codes

Errors and informational messages that pertain to the tape drives are shown in the drive status area of the library's operator panel. Table 33 describes the codes that display.

Note: In this table, *enclosure* refers to the Ultrium Scalable Tape Library.

Attention: If the tape drive detects a permanent error and displays an error code other than 0, it automatically performs a drive dump. If you force a drive dump, the existing dump will be overwritten and data will be lost. After you force a drive dump, do not turn off the power to the tape drive or library, or you may lose the dump data.

Table 33. Drive error codes

Code	Cause and Action
0	No error occurred and no action is required. This code displays: • When power is cycled (turned off, then on) to the tape drive. • When diagnostics have finished running and no error occurred. **Note:** The single-character display is blank during normal operation of the tape drive.
1	Cooling problem. The tape drive detected that the recommended operating temperature was exceeded. Perform the following action: 1. If a fan is present in the enclosure, ensure that it is rotating and is quiet. If not, replace the fan (for instructions about replacing the fan, see your enclosure's documentation). 2. Remove any blockage that prevents air from flowing freely through the tape drive. 3. Ensure that the operating temperature and airflow is within the specified range (see "Specifications" on page 27). 4. If the operating temperature is within the specified range and the problem persists, replace the tape drive. The error code clears when you power-off the tape drive or place it in maintenance mode.
2	Power problem. The tape drive detected that the externally supplied power is either approaching the specified voltage limits (the drive is still operating) or is outside the specified voltage limits (the drive is not operating). Perform the following action: 1. Ensure that the power connector is properly seated. 2. Ensure that the proper dc voltages are being applied within the tolerances allowed (see "Specifications" on page 27). 3. If the proper voltages are being applied but the problem persists, replace the tape drive. The error code clears when you power-off the tape drive or place it in maintenance mode.

Table 33. Drive error codes (continued)

Code	Cause and Action
3	Firmware problem. The tape drive determined that a firmware error occurred. Perform the following action: 1. Collect a drive dump from one of the following: **Note:** Do not force a new dump; the tape drive has already created one. • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the *IBM Ultrium Device Drivers Installation and User's Guide*. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center. • Ultrium Tape Drives (to copy a drive dump, see "Copying a Drive Dump" on page 126). 2. Power the tape drive off and on, then retry the operation that produced the error. 3. If the problem persists, download new firmware and retry the operation. 4. If the problem persists, send the drive dump that you collected in step 1 to your Support Center. The error code clears when you power-off the tape drive or place it in maintenance mode.
4	Firmware or tape drive problem. The tape drive determined that a firmware or tape drive hardware failure occurred. Perform the following action: 1. Collect a drive dump from one of the following: **Note:** Do not force a new dump; one already exists. • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the *IBM Ultrium Device Drivers Installation and User's Guide*. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center. • Ultrium Tape Drives (to copy a drive dump, see "Copying a Drive Dump" on page 126). 2. Power the tape drive off and on, then retry the operation that produced the error. The error code clears when you power-off the tape drive or place it in maintenance mode. 3. If the problem persists, download new firmware and retry the operation; if new firmware is not available, replace the tape drive.
5	Tape drive hardware problem. The drive determined that a tape path or read/write error occurred. To prevent damage to the drive or tape, the drive will not allow you to insert a cartridge if the current cartridge was successfully ejected. The error code may clear when you cycle power to the tape drive or place it in maintenance mode. If the problem persists, replace the tape drive.

Table 33. Drive error codes (continued)

Code	Cause and Action
6	Tape drive or media error. The drive determined that an error occurred, but it cannot isolate the error to faulty hardware or to the tape cartridge. Perform the following action: **For Problems with Writing Data:** If the problem occurred while the drive was writing data to the tape, and if you know the volume serial number (located on the cartridge label) of the tape cartridge loaded in the drive when the problem occurred, retry the operation with a different cartridge: • If the operation succeeds, the original cartridge was defective. Copy data from the defective cartridge and discard it. • If the operation fails and another drive is available, insert the cartridge into the other drive and retry the operation. – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first drive and run drive diagnostics (see "Running Drive Diagnostics" on page 223). - If the diagnostics fail, replace the drive. - If the diagnostics succeed, the error was temporary. • If the operation fails and another drive is not available, insert a scratch cartridge into the drive and run the tape drive diagnostics (see "Running Drive Diagnostics" on page 223). – If the diagnostics fail, replace the drive. – If the diagnostics succeed, discard the cartridge. If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (see "Running Drive Diagnostics" on page 223): • If the diagnostics fail, replace the tape drive. • If the diagnostics succeed, run the Head Read/Write test (see "Running Drive Diagnostics" on page 223). – If the Test Head diagnostic fails, replace the tape drive. – If the Test Head diagnostic succeeds, replace the cartridges that caused the problem. The error code clears when you remove the tape cartridge or place the drive in maintenance mode. **For Problems with Reading Data:** If the problem occurred while the drive was reading data from the tape, and if you know the volume serial number of the tape cartridge, perform one of the following procedures: • If another drive is available, insert the cartridge into the other drive and retry the operation: – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first drive and run the tape drive diagnostics (see "Running Drive Diagnostics" on page 223): - If the diagnostics fail, replace the drive. - If the diagnostics succeed, the error was temporary. • If another drive is not available, insert a scratch cartridge into the drive and run the tape drive diagnostics (see "Running Drive Diagnostics" on page 223): – If the diagnostics fail, replace the drive. – If the diagnostics succeed, discard the cartridge. If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (see "Running Drive Diagnostics" on page 223): • If the diagnostics fail, replace the tape drive. • If the diagnostics succeed, run the Head Read/Write test (see "Running Drive Diagnostics" on page 223 guide): – If the Test Head diagnostic fails, replace the tape drive. – If the Test Head diagnostic succeeds, replace the cartridges that caused the problem. The error code clears when you remove the tape cartridge or place the drive in maintenance mode.

Table 33. Drive error codes (continued)

Code	Cause and Action
7	A high probability of media error. The tape drive determined that an error occurred because of a faulty tape cartridge, and expired cleaning cartridge, or the insertion of an FMR cartridge as a data cartridge. • Try another tape cartridge. If the problem occurs with multiple tape cartridges, see the section for resolving media-related problems in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide. • Dispose of the current cleaning cartridge and insert a new cleaning cartridge. • If the FMR cartridge is no longer needed, go to "Creating or Erasing an FMR Tape" on page 227. The error code clears when you remove the tape cartridge or place the drive in maintenance mode.
8	**For SCSI drive:** Tape drive or SCSI bus failure. The tape drive determined that a failure occurred in the tape drive's hardware or in the SCSI bus. See the section for fixing SCSI bus errors in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide. The error code clears 10 seconds after the drive detected the error or when you place the drive in maintenance mode. **For Fibre Channel drive:** Tape drive or Fibre Channel failure. The tape drive determined that a failure occurred in the tape drive's hardware or in the Fibre Channel. It detects light through the fiber cable but cannot perform data communication properly. The length of the cable between the devices should not exceed 500 m (1640 ft). See the section for fixing Fibre Channel errors in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide. The error code clears when the drive detects light and can communicate, or when you place the drive in maintenance mode.
9	Tape drive or LDI (RS-422) error. The tape drive determined that a failure occurred in the tape drive hardware or in the LDI (RS-422) connection. • Power cycle the drive. If the power-on self test is successful, the problem is resolved. • If the problem persists, replace the tape drive sled (see the appropriate section in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide). • If the problem persists after replacing the drive, the problem is with the cable between the drive sled and the power distribution board, the power distribution board itself, or the main board. The error code clears when you place the drive in maintenance mode.
o, c, b, or h	No error or message assigned. There may be a problem with the single-character display. Turn the power off, then on and determine whether all segments on the single-character display are lit. If so, you may have a down-level version of both your library's firmware and documentation (the documentation may not describe all of the available error codes). Refer to the latest version of the firmware or documentation.
A	Tape drive hardware problem. The tape drive determined that a problem occurred which degraded the operation of the tape drive, but it did not restrict continued use. If the problem persists, replace the tape drive. The drive is usable, though the single-character display continues to indicate an error and the status light flashes amber. The error code may clear when you cycle power to the tape drive or place it in maintenance mode.
B	No error or message is assigned. See error code 8 in this table.
C	The tape drive needs to be cleaned. Clean the tape drive. See "Cleaning Drives" on page 244. The error code clears when you clean the tape drive or place it in maintenance mode.
d	Fibre Channel AL_PA conflict. More than one device has the same address. Each device must have its own unique AL_PA address. See "Setting the Fibre Channel Loop IDs" on page 76.
D	No error or message assigned. See error code 0 in this table.

Table 33. Drive error codes (continued)

Code	Cause and Action
E	Informational message. The tape drive's Fibre Channel port has been placed offline by another device or by an operator. This code is set when the Offline command is received from another device on the Fibre Channel interface. Determine why the device at the other end of the Fibre Channel (the server, switch, or other device) placed the drive offline. The drive is placed online when it receives the Online command from the Fibre Channel interface. After a reset, the drive comes online.
F	The tape drive determined that no light is being received over the Fibre Channel. See the section for fixing Fibre Channel errors in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide. The error code clears when the drive detects light or when you place the drive in maintenance mode.

Selecting a Diagnostic or Maintenance Function

The Ultrium 2 Tape Drive can run diagnostics, test write and read functions, test a suspect tape cartridge, update its own firmware, and perform other diagnostic and maintenance functions listed in Table 34. The drive must be in maintenance mode to perform these functions. To place the drive in maintenance mode and to select a function, see Table 34.

Attention: Maintenance functions cannot be performed concurrently with read or write operations. While in maintenance mode, the Ultrium 2 Tape Drive does not receive SCSI commands from the host.

Table 34. Diagnostic and maintenance functions

Function Code 1 - Run SCSI or Fibre Channel Tape Drive Diagnostics

Causes the tape drive to run self tests.
 	
Attention: Insert only a scratch data cartridge for this test. Data on the cartridge will be overwritten.
1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until **1** appears in the single-character display. If you cycle past **1**, continue to press the unload button until it redisplays.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **1** flashes, the drive runs diagnostics for approximately 90 seconds, then **C** flashes. When **C** flashes, the drive is waiting for a cartridge.
5. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, **1** flashes:
  • If the diagnostic completes successfully, it begins again and runs for a maximum of 10 times. Each loop takes approximately 20 minutes to run. After the tenth loop, the diagnostic stops and automatically exits maintenance mode. To halt the diagnostic, press the unload button within the first 20 minutes of the test (or the diagnostic will run another 20 minutes). The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The diagnostic continues to the end of its loop and then stops. The tape drive then displays **0**, rewinds and unloads the cartridge, and exits maintenance mode.
  • If the diagnostics fail, the status light flashes amber and an error code displays. The tape drive unloads the tape cartridge and exits maintenance mode. To resolve the error, locate the code in Table 33 on page 310.

Table 34. Diagnostic and maintenance functions (continued)

Function Code 2 - Update Tape Drive Firmware from FMR Tape

Causes the tape drive to load updated firmware from a field microcode replacement (FMR) tape.
 	
 Attention: Do not power-off the tape drive while loading code.
 1. Make sure that no cartridge is in the drive.
 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
 3. Press the unload button once per 1.5 seconds until **2** appears in the single-character display. If you cycle past **2**, continue to press the unload button until it redisplays.
 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **C** flashes. When **C** flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR tape cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, **2** flashes and the tape drive loads the updated firmware from the FMR tape cartridge into its erasable programmable read-only memory (EPROM) area:
  • If the update completes successfully, the tape drive displays **0**, rewinds and unloads the FMR tape, resets itself, and is ready to use the new firmware.
  • If the update fails, the tape drive posts an error code to the single-character display (to resolve the error, see Table 33 on page 310). The drive then unloads the FMR tape and exits maintenance mode.

Function Code 3 - Create FMR Tape

Causes the tape drive to copy its field microcode replacement (FMR) data to a scratch data cartridge.
 	
 Attention: If you select this function, the tape drive will overwrite existing data on the scratch data cartridge.
 1. Make sure that no cartridge is in the drive.
 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
 3. Press the unload button once per 1.5 seconds until **3** appears in the single-character display. If you cycle past **3**, continue to press the unload button until it redisplays.
 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **C** flashes. When **C** flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write protected (or the tape drive exits maintenance mode). After you insert the cartridge, **3** flashes and the tape drive copies the FMR data to the scratch data cartridge:
  • If the tape drive creates the FMR tape successfully, it displays **0**, rewinds and unloads the new FMR tape, and exits maintenance mode.
  • If the tape drive fails to create the FMR tape, it displays **7**, unloads the FMR tape, and exits maintenance mode.

Table 34. Diagnostic and maintenance functions (continued)

Function Code 4 - Force a Drive Dump
Causes the tape drive to perform a collection (or *dump*) of data. (A drive dump is also known as a save of the firmware trace.) The dump (firmware trace) can only be analyzed by IBM. **Note:** When an error code displays, a red dot also displays to remind you that a dump already exists. If you perform Function Code 4, it will overwrite the dump and cause the error information to be lost. 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Press the unload button once per 1.5 seconds until **4** appears in the single-character display. If you cycle past **4**, continue to press the unload button until it redisplays. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **4** displays, followed by **0**. The single-character display then goes blank, and the tape drive exits maintenance mode. An illuminated red dot on the single-character display indicates that a drive dump has been created. To retrieve the dump from the drive, see Function Code 5 on page 316. You can also perform this operation when the tape drive is in normal operating mode. Simply press and hold the unload button for 10 seconds.
Function Code 5 - Copy the Drive Dump to Tape (at Beginning of Tape)
Causes the tape drive to copy data from a drive dump (captured with Function Code 4) to the beginning of a scratch data cartridge. An illuminated red dot on the single-character display indicates that a drive dump has been created. 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Press the unload button once per 1.5 seconds until **5** appears in the single-character display. If you cycle past **5**, continue to press the unload button until it redisplays. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **C** flashes. When **C** flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write-protected (or the tape drive exits maintenance mode). After you insert the cartridge, **5** flashes and the tape drive writes the dump data to the tape (at the beginning of the tape). When the function is complete, **0** displays, the drive rewinds and unloads the tape, and exits maintenance mode. From the server, issue the SCSI READ command to read the dump from the tape to a file or electronic image. For information about where to send the electronic image, contact your OEM Product Application Engineer (PAE).

Table 34. Diagnostic and maintenance functions (continued)

Function Code 6 - Run SCSI or Fibre Channel Wrap Test

Causes the drive to perform one of the following:
 	
• A check of the SCSI circuitry from and to the SCSI connector
 	
• A check of the Fibre Channel circuitry from and to the Fibre Channel connector or fiber cable
 	
To run the test, determine whether your drive uses a SCSI or Fibre Channel interface, then choose one of the following procedures.
 	
Running a SCSI Wrap Test
 	
This test evaluates the SCSI circuitry. A SCSI LVD wrap plug, a SCSI LVD terminator, and a Y-cable are required for this procedure.
Note: You can terminate the Generation 1 drive internally while running the SCSI wrap test. Internal termination is not built into the Generation 2 drive, therefore you must run the SCSI wrap test by using a Y-cable and external termination.
 	
Before you select this function, you must configure the drive to supply term power, terminate the SCSI bus, and attach the SCSI wrap plug. Configure the drive to supply term power by placing a jumper on pin 6 of the drive's SCSI ID connector (as shown by the shaded area in the figure below).
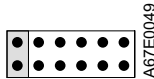 	
Connect a Y-cable to the drive's SCSI connector. Place a terminator on one end of the Y-cable and the wrap plug on the other end.
 	
1. Ensure that the drive does not contain a cartridge.
 	
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
 	
3. Press the unload button once per 1.5 seconds until **6** appears in the single-character display. If you cycle past **6**, continue to press the unload button until it redisplays.
 	
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
 	
    • If the test is successful, it loops and begins again. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop, then stops. **0** displays and the drive exits maintenance mode. To continue to isolate the problem, go to the section for fixing SCSI bus errors in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* guide and locate the steps to take after you run the SCSI wrap test.
 	
    • If the test fails, **8** displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, replace the tape drive (see the instructions for replacing a tape drive sled in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*)(see .

Table 34. Diagnostic and maintenance functions (continued)

Running a Fibre Channel Wrap Test

This test evaluates the Fibre Channel circuitry at the drive's Fibre Channel connector, then at the fiber cable. A Fibre Channel wrap plug is required for this procedure. To run the wrap test through the fiber cable, a duplex adapter is required.

All cables and wrap plugs are hot-pluggable (that is, they can be removed from or added to the drive while the drive or its enclosure is powered-on). Do not bend the fiber cable more than a radius of 50.8 mm (2 in.) or the optical fiber may break.

1. Take all devices on the Fibre Channel offline (for instructions, refer to your server's documentation).

2. Make sure that no cartridge is in the drive.

3. Disconnect the fiber cable from the drive and replace it with the Fibre Channel wrap plug. (When you disconnect the cable, the connection to the Fibre Channel loop may break, but will be restored at the end of the procedure when you reconnect the cable. For other devices on the loop, operations may temporarily be disrupted.)

   Attention: Do not run the wrap test while the drive is connected to a Fibre Channel loop. This could disturb the Fibre Channel loop and cause performance or I/O problems.

4. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
   Note: If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.

5. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.
   Note: If you cycle past **6**, press the unload button once per second until it redisplays.

Testing the Circuitry at the Drive's Fibre Channel Connector

6. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:

   - If the test is successful, the circuitry at the drive's Fibre Channel connector is working properly. The test loops and begins again. Press the unload button. **0** displays and the tape drive exits maintenance mode. Continue to step 7 to test the fiber cable.

   - If the test fails, an error code displays and the status light flashes amber. The test stops and the drive exits maintenance mode. To resolve the error, locate the code in Table 33 on page 310.

7. Disconnect the Fibre Channel wrap plug from the drive.

Testing the Circuitry at the Fiber Cable

8. Connect the duplex adapter, then the Fibre Channel wrap plug to the end of the fiber cable.
   Note: The Fibre Channel wrap test can only be run on cable lengths up to 250 meters (820 ft).

9. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
   Note: If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.

10. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.
    Note: If you cycle past **6**, press the unload button once per second until it redisplays.

11. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:

    - If the test is successful, the drive and the cable are working properly. The problem is at the server. To resolve the error, refer to the service guide for the server.

    - If the test fails, replace the fiber cable.

12. Remove the Fibre Channel wrap plug and the duplex adapter, and reconnect the fiber cable.

Table 34. Diagnostic and maintenance functions (continued)

Function Code 7 - Run LDI or RS-422 Wrap Test

Causes the tape drive to perform a check of the circuitry from and to the LDI or RS-422 connector.

Before you select this function, attach an LDI or RS-422 wrap plug to the tape drive:s LDI or RS-422 connector (in place of the LDI or RS-422 cable).

1. Make sure that no cartridge is in the drive.

2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.

3. Press the unload button once per 1.5 seconds until **7** appears in the single-character display. If you cycle past **7**, continue to press the unload button until it redisplays.

4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **7** flashes and the tape drive automatically starts the test:

    *   If the test is successful, it loops and begins again. To halt the test, press the unload button. The test continues to the end of its loop and then stops. The tape drive then displays **0** and exits maintenance mode.

    *   If the test fails, **9** displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, locate **9** in Table 33 on page 310.

Function Code 8 - Convert FMR Tape to Scratch Tape

Causes the tape drive to erase the field microcode replacement (FMR) data on a scratch data cartridge and rewrite the cartridge memory on the tape. This turns the cartridge into a valid scratch data cartridge.

1. Make sure that no cartridge is in the drive.

2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.

3. Press the unload button once per 1.5 seconds until **8** appears in the single-character display. If you cycle past **8**, continue to press the unload button until it redisplays.

4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **C** flashes. When **C** flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, **8** flashes, the tape drive erases the firmware on the tape, then rewrites the header in the cartridge memory to change the cartridge to a valid scratch data cartridge:

    *   If the operation is successful, the tape drive displays **0**, rewinds and ejects the newly converted scratch data cartridge, and exits maintenance mode.

    *   If the operation is not successful, an error code displays. To resolve the error, locate the code in Table 33 on page 310.

Table 34. Diagnostic and maintenance functions (continued)

Function Code 9 - Display Error Code Log
Causes the tape drive to display the last 10 error codes, one at a time (the codes are ordered; the most recent is presented first and the oldest (tenth) is presented last).
1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until **9** appears in the single-character display. If you cycle past **9**, continue to press the unload button until it redisplays.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, press the unload button to view the most recent error code. Press the unload button again to view successive error codes. If you press the unload button for 3 seconds after the tenth error code displays, **0** displays (if there are no errors in the log) and the drive exits maintenance mode.
Function Code A - Clear Error Code Log
Causes the tape drive to erase the contents of the error code log.
1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until **A** appears in the single-character display. If you cycle past **A**, continue to press the unload button until it redisplays.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive erases all errors from the error code log, displays **0**, then exits maintenance mode.
Function Code C - Insert Cartridge into Tape Drive
This function cannot be selected by itself. It relates to other maintenance functions (such as Run Tape Drive Diagnostics or Create FMR Tape) that require an FMR tape cartridge or scratch tape cartridge that is not write protected.

Table 34. Diagnostic and maintenance functions (continued)

Function Code E - Test Cartridge & Media

Causes the tape drive to perform a Write/Read test (on the edge bands) to ensure that a suspect cartridge and its magnetic tape are acceptable. The tape drive takes approximately 10 minutes to run the test.

Attention: Data on the suspect tape will be overwritten.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until `E` appears in the single-character display. If you cycle past `E`, continue to press the unload button until it redisplays.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, `C` flashes. When `C` flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, `E` flashes and the test begins:
   - If no error is detected, the test begins again and runs for a maximum of 10 times. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays `0`, and exits maintenance mode.
   - If an error is detected, the tape drive displays `7`, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate `7` in Table 33 on page 310.

Function Code F - Fast Read/Write Test

Causes the tape drive to perform tests to ensure that the drive can read from and write to tape. This diagnostic performs fewer tests than the Run Tape Drive Diagnostics test (Function Code 1). The tape drive takes approximately three minutes to run the test. The Fast Read/Write Test is not as comprehensive a test and is not recommended for isolating errors between the drive and the media.

Attention: Data on the suspect tape will be overwritten.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until `F` appears in the single-character display. If you cycle past `F`, continue to press the unload button until it redisplays.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, `C` flashes. When `C` flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, `F` flashes and the test begins.
   - If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 3 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays `0`, and exits maintenance mode.
   - If an error is detected, the tape drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate the code in Table 33 on page 310.

Table 34. Diagnostic and maintenance functions (continued)

Function Code H - Test Head

Causes the tape drive to perform the Head Resistance Measurements test and a Write/Read test (on the center of the tape). The drive runs these tests to ensure that the tape drive's head and tape-carriage mechanics are working correctly. The tape drive takes approximately 10 minutes to run the test.
 	
 1. Make sure that no cartridge is in the drive.
 	
 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
 	
 3. Press the unload button once per 1.5 seconds until **H** appears in the single-character display. If you cycle past **H**, continue to press the unload button until it redisplays.
 	
 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, **C** flashes. When **C** flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, **H** flashes and the test begins:
 	
    • If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 10 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays **0**, and exits maintenance mode.
 	
    • If an error is detected, the tape drive displays **5**, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate **5** in Table 33 on page 310.

Function Code L - Reserved for Future Use
Reserved for future use.
Function Code P or U - Enable or Disable Post Error Reporting

Used by support personnel during error detection, this function is an alternate method of setting or preventing the post error (PER) bit in the SCSI Read-Write Error Recovery Page. For more information, refer to the MODE SENSE command in the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference*.
 	
 1. Make sure that no cartridge is in the drive.
 	
 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
 	
 3. Perform one of the following:
 	
    • To enable post error reporting, press the unload button once per 1.5 seconds until **U** appears in the single-character display. If you cycle past **U**, continue to press the unload button until it redisplays.
 	
    • To disable post error reporting, press the unload button once per 1.5 seconds until **P** appears in the single-character display. If you cycle past **P**, continue to press the unload button until it redisplays.
 	
 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the drive displays one of the following:
 	
    • **P** to indicate that post error reporting is enabled.
 	
    • **U** to indicate that post error reporting is disabled.

Exiting Maintenance Mode

To manually exit maintenance mode, press the unload button once per second until **0** appears on the single-character display. Press and hold the unload button for 3 seconds. The drive exits maintenance mode (the solid amber status light turns off).

Appendix E. Feature Codes

Table 35 lists features you can order for the Ultrium Scalable Tape Library.

Note: Power cords are listed separately in Appendix F, "Power Cords", on page 325.

Table 35. Features for the Ultrium Scalable Tape Library

Feature Code	Description
*1450	Multi-Path feature (field upgrade)
1660	Remote Management Unit (RMU)
*1680	Control path failover feature
2895	Interposer, iSeries feature 6501
5096	Interposer SC-to-LC Fibre Channel
5098	Inline HVD SCSI terminator
5099	VHDCI-to-HD68 cable interposer
5302	HD68-to-HD68 SCSI cable, 2.5 m (8 ft)
5303	HD68-to-HD68 SCSI cable, 0.7 m (2 ft)
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)
5602	VHDCI-to-HD68 SCSI cable, 2.5 m (8 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 (65 ft)
5625	VHDCI-to-HD68 SCSI cable, 25 m (82 ft)
5805	SC-to-SC Fibre Channel cable, 5 m (17 ft)
5813	SC-to-SC Fibre Channel cable, 13 m (43 ft)
5825	SC-to-SC Fibre Channel cable, 25 m (82 ft)
5861	SC-to-SC Fibre Channel cable, 61 m (200 ft)
5907	SC-to-LC Fibre Channel cable, 7 m (23 ft)
5913	SC-to-LC Fibre Channel cable, 13 m (43 ft)
5922	SC-to-LC Fibre Channel cable, 22 m (72 ft)
5961	SC-to-LC Fibre Channel cable, 61 m (200 ft)
*6005	LC-to-LC Fibre Channel cable, 5 m (17 ft)
*6013	LC-to-LC Fibre Channel cable, 13 m (43 ft)
*6025	LC-to-LC Fibre Channel cable, 25 m (82 ft)
*6061	LC-to-LC Fibre Channel cable, 61 m (200 ft)
8001	IBM LTO Ultrium Data Cartridge
8002	IBM LTO Ultrium Cleaning Cartridge
8003	LTO Ultrium 1 LVD drive sled

Table 35. Features for the Ultrium Scalable Tape Library (continued)

Feature Code	Description
8004	LTO Ultrium 2 HVD/DIFF drive sled
8005	SAN Data Gateway Module, LVD
8006	Rackmount kit
8007	18-slot tape storage column
8008	Redundant dc power supply
8010	IBM LTO Ultrium Data Cartridge, 20-pack
8012	12-slot I/O station
8013	6-cartridge magazine with cover
8101	IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
*8103	Ultrium 2 LVD tape drive
*8104	Ultrium 2 HVD tape drive
*8105	Ultrium 2 Fibre Channel Tape Drive
8110	20-pack of IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
9210	Attached to HP-UX system
9211	Attached to Sun system
9212	Attached to Windows system
9213	Attached to other non-IBM system
*9215	Attached to Linux system
9400	Attached to AS/400 and iSeries system
*9450	Multi-Path feature (plant installation)
9600	Attached to RS/6000® and pSeries system
9704	VHDCI-to-HD68 SCSI cable, 4.5 m (14 ft)
9705	HD68-to-HD68 SCSI cable, 5 m (17 ft)
9706	SC-to-SC Fibre Channel cable, 5 m (17 ft)
9707	SC-to-LC Fibre Channel cable, 7 m (23 ft)
* Applies to Ultrium 1 and Ultrium 2 drives	

Appendix F. Power Cords

To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

Table 36 lists the power cord part number, feature code, the country or region where the power cord can be used, and the plug's standard reference. The last column in the table contains an index number that you can match to a specific receptacle type in Figure 399 on page 327. These power cords are only available at the time of initial purchase or as a field replaceable unit (FRU) part from your IBM Service Representative.

All power cords use an appliance coupler that complies with the International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

If the power cord that you receive does not match your receptacle, contact your local dealer.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL), are certified by the Canadian Standards Association (CSA), and comply with the plug standards of the National Electrical Manufacturers Association (NEMA). For other worldwide geographies, plug standards are listed in Table 36.

Power Cord Information

Table 36. Power cord information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 399 on page 327
US/Canada 2.8 m, 125V FC 9800 PN 6952300 (See Note)	NEMA 5-15P	Aruba, Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Curacao, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, South Korea, Suriname, Taiwan, Trinidad Tobago, Venezuela, US	1
Chicago 1.8 m, 125 V FC 9986 PN 6952301	NEMA 5-15P	Chicago, U.S.A.	1
US/Canada 2.8 m, 250 V FC 9833 PN 1838574	NEMA 6-15P	Aruba, Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Costa Rica, Curacao, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Liberia, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Suriname, Taiwan, Thailand, Trinidad Tobago, Venezuela, US	2

Table 36. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 399 on page 327
Australia 2.8 m, 250V FC 9831 PN 13F9940	AS 3112 NZS 198	Argentina, Australia, China, Colombia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	3
France, Germany 2.8 m, 250V FC 9820 PN 13F9979	CEE 7 - VII	Afghanistan, Algeria, Andorra, Angola, Aruba, Austria, Belgium, Benin, Brazil, Bulgaria, Burundi, Cameroon, Central African Republic, Chad, Congo Brazzaville, Curacao, Czechoslovakia, Denmark, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Kenya, Korea, Lebanon, Luxumbourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, Netherlands Antilles, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Saudi Arabia, Senegal, Spain, Sweden, Sudan, Syria, Togo, Tunisia, Turkey, Upper Volta, USSR, Yugoslavia, Zaire, Zimbabwe, Vietnam	4
Denmark 2.8 m, 250V FC 9821 PN 13F9997	DK2-5A	Denmark	5
South Africa 2.8 m, 250V FC 9829 PN 14F0015	SABS 164	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	6
United Kingdom 2.8 m, 250V FC 9825 PN 14F0033	BS 1363	Antigua, Bahrain, Bermuda, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Fiji, Ghana, Guyana, India, Iraq, Ireland, Jordan, Kenya, Kuwait, Malaysia, Malawi, Malta, Nepal, Nigeria, Oman, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, UK, United Arab Emirate (Dubai), Yemen, Zambia	7
Switzerland 2.8 m, 250V FC 9828 PN 14F0051	SEV SN 416534	Liechtenstein, Switzerland	8
Italy 2.8 m, 250V FC 9830 PN 14F0069	CEI 23- 16	Chile, Ethiopia, Italy, Libya, Somalia	9

Table 36. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 399
Israel 2.8 m, 250V FC 9827 PN 14F0087	S11-32-1971	Israel	10
Argentina 2.8 m, 250V FC 9834 PN 36L8880	IEC 83-A5	Argentina, Brazil, Colombia, Paraguay, Trinidad Tobago, Uruguay	11
China 2.8 m, 250V FC 9840 PN 02K0546	CCEE	People's Republic of China	12
Note: Part number 6952300 is the default power cord for the countries or regions listed. If you do not specify a power cord when you place your order, IBM provides this power cord.			

Types of Plugs

Figure 399 shows the plugs that are used by the power cords in Table 36 on page 325. Match the index number that is beside each plug to the index number in the table.
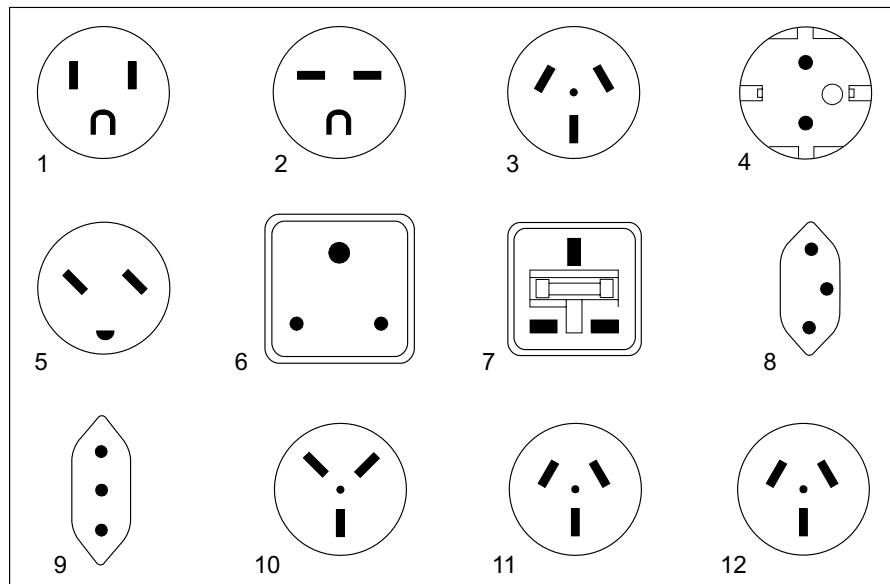
Figure 399. Types of receptacles

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

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.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 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.″

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

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Chinese Class A Electronic Emission Statement

中华人民共和国"A类"警告声明

声　明
　　此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

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。

Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication.

Numbers

2:1 compression. The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression. In 2:1 compression, twice as much data can be stored with compression as can be stored without compression.

IBM TotalStorage Ultrium Scalable Tape Library 3583. A device that can be attached to a supported server and used to write data to and from magnetic tape. With its robotics, the tape library can process up to 72 tape cartridges each with a capacity of 100 GB and at a data transfer rate of 14.9 MB per second.

A

A. Ampere.

ac. Alternating current.

AL_PA. Arbitrated Loop Physical Address

adapter card. A circuit board that adds function to a computer.

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.

ambient temperature. The temperature of air or other media in a designated area, particularly the area surrounding equipment.

ampere (A). 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. See *Fibre Channel arbitrated loop (FC-AL).*

archive. To collect and store files in a designated place.

automatic cleaning. Represented as Auto Clean on the library's operator panel, a function that lets you specify that the library automatically clean the tape drive head with a cleaning cartridge.

B

bar code. A code representing characters by sets of parallel bars of varying thickness and separation which are read optically by transverse scanning.

bar code label. A specially coded label that can be affixed to a tape cartridge and which enables a device to identify the cartridge and its volume serial number. 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. In the tape library, a device specialized for scanning and reading bar codes and converting them into either the ASCII or EBCDIC digital character code.

bit. Either of the digits 0 or 1 when used in the binary numbering system.

browser. A client program that initiates requests to a web server and displays the information that the server returns.

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 fundamental data unit.

C

capacity. The amount of data that can be contained on storage media and expressed in bytes of data.

cartridge. See *tape cartridge.*

cartridge door. On a tape cartridge, a hinged barrier that can be opened to access or closed to protect the magnetic tape within the cartridge.

cartridge memory. See *LTO cartridge memory.*

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 storage slot. Individual slot located within a magazine that is used to house tape cartridges.

caster. A wheel mounted in a swivel frame and used for supporting the Tape Library.

CD. Compact disc.

centimeter (cm). One one-hundredth of a meter (0.01 m). Approximately 0.39 inch.

circuit breaker. A switch that automatically interrupts an electric circuit under an infrequent abnormal condition.

cleaning cartridge. A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

cm. Centimeter.

compact disc (CD). A disc, usually 4.75 inches in diameter, from which data is read optically by means of a laser.

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.

current. The quantity of charge per unit time, measured in Amperes (Amps, A).

D

daisy-chain. A hardware configuration in which devices are connected one to another in a series.

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 rate. The average number of bits, characters, or blocks per unit time passing between corresponding equipment in a data transmission system. The rate is expressed in bits, characters, or blocks per second, minute, or hour.

dc. Direct current.

default setting. The value that is assumed when none is explicitly specified.

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.

DHCP. Dynamic host configuration protocol.

diagnostic. A software program that is designed to recognize, locate, and explain faults in equipment or errors in programs.

Diagnostic Menu. A collection of diagnostic and maintenance functions that the tape library can perform. Each function has a menu name that you can choose from the operator panel to activate the function.

differential . See *High Voltage Differential (HVD)*.

direct current (dc). An electrical current flowing in one direction only and substantially constant in value.

disable. To make nonfunctional.

download. To transfer programs or data from a computer to a connected device, typically a personal computer.

drive. See *IBM Ultrium Tape Drive*.

drive head. The component that records an electrical signal onto magnetic tape, or reads a signal from tape into an electrical signal.

Dynamic Host Configuration Protocol (DHCP). An agreed-upon format for assigning IP addresses to devices on a network at the moment they are needed rather than in advance.

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.

erase. To remove recorded matter from a magnetic tape.

error code log. A repository within a tape drive's firmware that contains a history of errors experienced by the drive.

Ethernet. Local area network (LAN) technology that transmits information between computers at speeds of 10 and 100 million bits per second (Mbps).

export. Pertaining to the tape library, to remove media from the library using the I/O station.

F

failover. The routing of all transactions to a second device when the first device fails.

Fibre Channel. An optics cable utilizing filaments to transmit data.

Fibre Channel arbitrated loop (FC-AL). In this topology, two or more Fibre Channel end points are interconnected through a looped interface. Information is routed through the loop to its destination.

Fibre Channel topologies. Shared loop host and storage controllers.

fiducial. A reference point which guides the cartridge handling device to the tape subsystem location.

field microcode replacement (FMR) tape. A tape cartridge that contains new or revised firmware (microcode).

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 (servers).

firmware. Proprietary code that is usually delivered as firmware as part of an operating system. Firmware is more efficient than software loaded from an alterable medium and 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.

flange. A rib or rim used for strength, for guiding, or for attachment to another object.

FMR tape. See *field microcode replacement tape*.

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.

G

GB. gigabyte.

GBIC. Gigabit interface converter.

Gbit. gigabit

gigabit (Gbit). 1 000 000 000 bits.

gigabyte (GB). 1 000 000 000 bytes.

grounded. Having or making an electrical connection with the earth.

gigabit interface converter (GBIC). Converts copper interface to optic interface.

H

head. See *drive head*.

hertz (Hz). A unit of frequency equal to one cycle per second.

High Voltage Differential (HVD/DIFF). A logic signaling system that enables data communication between a supported server and another device, such as the tape library. HVD/DIFF 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*.

host . The controlling or highest-level system in a data communication configuration. Synonymous with *server*.

host cleaning. A method of cleaning that enables the host (server) to detect the need to clean an Ultrium Tape Drive and to control the cleaning process.

HVD/DIFF. High voltage differential.

Hz. Hertz.

I

IBM Ultrium Tape Drive. Located within the 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.

import. Pertaining to the tape library, to insert media into the library using the I/O station.

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.

insert. Pertaining to the tape library, to place a tape cartridge into a cartridge storage slot in the library.

install. To set up for use or service. 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.

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 type and style.

inventory. A survey of tape cartridges in the library.

K

kg. Kilogram.

kilogram (kg). One thousand grams (approximately 2.2 pounds).

L

LAN. Local area network.

label. See *bar code label*.

label area. On the LTO Ultrium tape cartridge, a recessed area next to the write-protect switch where a label must be affixed.

LCD. See *liquid crystal display*.

leader pin. With 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.

LED. Light-emitting diode.

light-emitting diode (LED). A semiconductor chip that gives off visible or infrared light when activated.

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 will 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 4-generation road map that provides for up to 1.6 TB per cartridge (at 2:1 compression) in Generation 4, with compressed transfer rate of up to 320 MB per second.

liquid crystal display (LCD). A low-power display technology used in computers and other I/O devices.

load. Pertaining to the tape library and following the insertion of a tape cartridge into a cartridge storage slot, the act (performed by the picker) 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.

Local area network (LAN). A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings.

Low Voltage Differential (LVD). A low-noise, low-power, and low-amplitude electrical signaling system that enables data communication between a supported server and another device such as the tape library. LVD signaling uses two wires to drive one signal over copper wire. The use of wire pairs reduces electrical noise and cross talk. This method of data transmission requires a cable that is no longer than 25 meters (82 ft.).

LTO. Linear Tape-Open.

LTO-CM. LTO cartridge memory.

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.

LVD. 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 of cleaning by which an operator selects a menu option from the tape library operator panel to perform cleaning on one or more of the Ultrium Tape Drives.

Management Information Base (MIB). A database of objects that can be monitored by a network management system.

MB. Megabyte.

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 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 which 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.

megabyte (MB).   1 000 000 bytes.

metal particle tape.   In the LTO Ultrium tape cartridge, tape that uses very small, pure metal particles (rather than oxide coatings) in the magnetic layer.

meter.   In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

MIB.   Management Information Base.

Model L18.   One of three versions of the tape library. The Model L18 has a storage capacity of 18 cartridges. Contrast with *Model L36, and Model L72*.

Model L36.   One of three versions of the tape library. The Model L36 has a storage capacity of 36 cartridges. Contrast with *Model L18, and Model L72*.

Model L72.   One of three versions of the tape library. The Model L72 has a storage capacity of 72 cartridges. Contrast with *Model L18, and Model L36*.

N

native data capacity.   The amount of data that can be stored without compression on a cartridge.

NVRAM.   Non-Volatile Random Access Memory

Non-Volatile Random Access Memory.   A type of memory that retains its contents when power is turned off.

O

oersted.   The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system. The oersted is the magnetic field strength in the interior of an elongated, uniformly wound solenoid that is excited with a linear current density in its winding of one abamper per 4π centimeters of axial length.

operating environment.   The temperature, relative humidity rate, and wet bulb temperature of the room in which the tape library routinely conducts processing.

operating system.   The master computer control program that translates the user's commands and allows application programs to interact with the computer's hardware.

operator panel.   Located on the front door of the tape library, the functional unit that contains buttons to control the tape library, and an LCD display that provides information about the operation of the library.

P

PDF.   Portable Document Format.

PDU.   Protocol Data Unit

pick.   Pertaining to the tape library, to remove, by means of a robotic device, a tape cartridge from a storage slot, tape drive, or I/O station.

picker.   An electromechanical device located on the picker assembly that moves cartridges between the cartridge storage slots, tape drives, or I/O station.

picker assembly.   The mechanism in the Tape Library that moves cartridges between the storage slots, tape drives, and the I/O station. The assembly includes the rotary axis motor, sensors, picker, and bar code reader.

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.

POST.   Power-On Self Test.

PostScript.   A standard specified by Adobe Systems, Incorporated, that defines how text and graphics are presented on printers and display devices.

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.   To remove electrical power from a device.

power-on.   (1) To apply electrical power to a device. (2) The state of a device when power has been applied to it.

Power-On Self Test (POST).   A series of diagnostic tests that are run automatically by a device when the power to that device is turned on.

power receptacle.   The mounted female electrical fitting that contains the live parts of the circuit.

power switch.   Located on the back of the tape library, a toggle switch that lets you turn the power to the library on or off.

Protocol Data Unit (PDU).   Messages sent over a network.

push buttons. Located below the operator panel of the tape library, 4 buttons that, when pressed, let you interact with the menus on the operator panel.

put. Pertaining to the tape library, to place, by means of a robotic device, a tape cartridge into a storage slot or drive.

R

rack. A unit that houses the components of a storage subsystem, such as the tape library.

rackmount kit. A packaged collection of articles used to install the rack-mounted version of the tape library.

read. To acquire or interpret data from a storage device, from a data medium, or from another source.

reinitialize. To reformat 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.

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 Management Unit (RMU). Device that allows user access to the library using a web browser.

remove. Pertaining to the tape library, to take a tape cartridge from a cartridge storage slot.

retention screws. Pertaining to the connector on a cable, two screws on either side of the connector that secure it to its mating connector.

RMU. Remote Management Unit

robotics. The picker and any associated mechanisms that move a tape cartridge within the tape library.

S

SAN. Storage area network

scratch cartridge. A data cartridge that contains no useful data, but can be written to with new data.

SCSI. Small computer systems interface.

SCSI-2. Small computer systems interface-2.

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 bus cable. See *SCSI bus*.

SCSI cable. See *SCSI bus*.

SCSI commands. An operation performed by a target (tape drive) for an initiator (host). The command is initiated by the operator from the host console.

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 host adapter card. The logic card that connects a host (server) to the SCSI bus cable. Synonymous with *SCSI controller*.

SCSI ID. The hexadecimal representation of the unique address (0–F) which a user assigns to the tape library and which is used in SCSI protocols to identify or select the drive. The user normally assigns and sets the SCSI ID when installing the drive.

SCSI wrap tool. A device that attaches to the SCSI connector on the tape library and enables internal tests on the SCSI interface.

seat, seated. (1) To fit to. (2) To ensure that one object is fitted to another object.

sequential access. An access technique for retrieving or storing data in which the data is read from, written to, or removed from a file based on the logical order (sequence) of the data in the file. When the tape library operates in sequential access mode, its firmware (not the server's application software) manages the cartridges (and thus the data).

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 pSeries, iSeries, HP, and Sun are servers. Synonymous with *host*.

ship group. The group of supplies, cords, or documentation that is shipped with the tape library.

shipping environment. The temperature, relative humidity rate, and wet bulb temperature of the environment to which the tape library is exposed when being transferred from one location to another.

Simple Network Management Protocol (SNMP). An agreed-upon format for managing complex networks. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.

sled. Pertaining to a tape library, the enclosure that contains the tape drive.

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 provide for faster data transmission rates than standard serial and parallel ports (up to 160 MB per second). The variations include:

- Fast/Wide SCSI: Uses a 16-bit bus, and supports data rates of up to 20 MBps.
- SCSI-1: Uses an 8-bit bus, and supports data rates of 4 MBps.
- SCSI-2: Same as SCSI-1, but uses a 50-pin connector instead of a 25-pin connector, and supports multiple devices.
- Ultra SCSI: Uses an 8- or 16-bit bus, and supports data rates of 20 or 40 MBps.
- Ultra2 SCSI: Uses an 8- or 16-bit bus and supports data rates of 40 or 80 MBps.
- Ultra3 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.
- Ultra160 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.

Small Computer Systems Interface-2 (SCSI-2). See *Small Computer Systems Interface (SCSI)*.

SNMP. Simple Network Management Protocol.

Storage Area Network (SAN). High-speed, open-standard scalable network of storage devices and servers providing accelerated data access.

storage environment. The temperature, relative humidity rate, and wet bulb temperature of the environment in which the tape library is nonoperational and being kept for future use.

storage slot. See *cartridge storage slot*.

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*.

TB. Terabyte.

teach. A process where the bar code reader reads the fiducial labels to identify the types of storage and tape drives installed in the library.

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.

terabyte (TB). 1 000 000 000 000 bytes.

toggle. To alternate between two states.

track. A linear or angled pattern of data written on a tape surface.

transfer rate. See *data transfer rate*.

trap. An unprogrammed conditional jump to a specified address that is automatically activated by hardware.

U

Ultra SCSI. See *Small Computer Systems Interface (SCSI)*.

Ultra2 SCSI. See *Small Computer Systems Interface (SCSI)*.

Ultrium Tape Drive. See *IBM Ultrium Tape Drive*.

unattended backup. The act of copying files without operator assistance.

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 tape library, the act (performed by the tape drive) of rewinding the tape into the cartridge and ejecting it from the drive and the act (performed by the picker) of transferring the cartridge to a cartridge storage slot.

URL. Uniform resource locator.

V

V dc. Volts of direct current.

VOLSER. Volume serial number.

volume serial number (VOLSER). A number that a computer assigns to a tape cartridge when it prepares (initializes) the cartridge for use.

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.

voltage. The electric potential or potential difference expressed in volts.

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 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 volume is write protected if some logical or physical mechanism causes the device processing the tape volume to prevent the program from writing on the volume.

write-protect switch. Located on the LTO Ultrium 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.

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B

C

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IBM TotalStorage
Ultrium Scalable Tape Library 3583
Setup and Operator Guide

Publication No. GA32-0411-04

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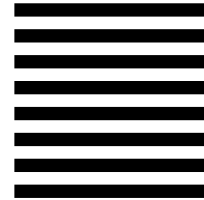
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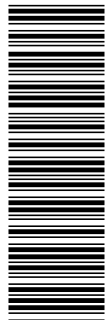Fold and Tape   **Please do not staple**   Fold and Tape

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