

IBM TotalStorage 3582 Tape Library



Setup, Operator, and Service Guide

IBM TotalStorage 3582 Tape Library



Setup, Operator, and Service Guide

Note

Before using this information and the product it supports, read the information in "Safety and Environmental Notices" on page xiii and "Notices" on page 309. To ensure that you have the latest publications, visit the Web site at: www.ibm.com/storage/lto.

Third Edition (May 2005)

This edition applies to the *IBM TotalStorage 3582 Tape Library Setup, Operator, and Service Guide* and to all subsequent releases and modifications until otherwise indicated in new editions.

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Read this First

Accessing Online Technical Support

For online Technical Support for your Library, visit
<http://www.ibm.com/storage/lto>.

Registering for My Support

My Support registration provides email notification when new firmware levels have been updated and are available for download and installation. To register for My Support, visit the web at <http://www.ibm.com/support/mySupport>.

Summary of Changes

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

Third Edition (May 2005)

The following changes have been made in this edition:

- Introduced new Write Once, Read Many (WORM) capability upgrade, including information on WORM cartridge specifications, compatibility, and ordering
- Updated power and acoustic specifications
- Added default configuration settings for Additional Control Path and Control Path failover
- New Write Performance Drive Maintenance Test replaced Fast/Read Write test
- Added new ASC/ASCQ support for WORM
- Added new WORM Tape Alert flags
- Revised procedure for removing/replacing a Base Unit

Second Edition (March 2005)

The following changes have been made in this edition:

- Added Ultrium 3 tape drive information
- Added Ultrium 3 media information
- Updated Rack Mount Kit installation information
- Added Desktop Kit installation information
- Added Input/Output Door installation information
- Restructured entire publication to improve usability
- Added the Preserve Dump procedure
- Added TapeAlert Flags
- Added "Start Here" table to Troubleshooting and Diagnostics

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Safety and Environmental Notices

Read all safety and operating instructions before operating this product. Keep this guide for future reference. This unit is engineered and manufactured to assure your personal safety. Improper use can result in potential electrical shock or fire hazards.

Note: In addition to the safety instructions in this guide, local and professional safety rules apply.

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

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:

Caution Notices

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 I	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.
 > 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.

Laser Safety and Compliance

Before using the IBM TotalStorage 3582 Tape Library, review the following laser safety information.

Class I Laser Product

The IBM TotalStorage 3582 Tape Library 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.

Intended Use

This equipment is designed for processing magnetic tape cartridges. Any other application is not considered the intended use. IBM® shall not be held liable for damage arising from unauthorized use of the library. The user assumes all risk in this aspect.

Safeguards

To maintain the safeguards, observe the following basic rules for installation, use, and servicing of the Library:

- **Follow Warnings** - Adhere to all warnings on the product and in the operating instructions.
- **Read Instructions** - Read and follow all installation and operating instructions.
- **Ventilation** - Situate the Library so that its location or position provides adequate front and rear ventilation (at least two inches).
- **Heat** - Situate the product away from heat sources such as radiators, heat registers, furnaces, or other heat-producing appliances.
- **Power Sources** - Connect the Library to a power source only of the type directed in these operating instructions or as marked on the product label.
- **Power Cord Protection** - Route the AC line cord so that it is not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the cord at the wall receptacle, and the point where the cord exits from the product.
- **Object and Liquid Entry** - Take care to ensure that objects do not fall and liquids are not spilled into the product's enclosure through openings.
- **Servicing** - Do not attempt to service the product beyond that described in the operating and installation instructions. All other servicing should be referred to qualified service personnel.

Precautions

Use these precautions when using or choosing an environment for the unit:

- Do not use oil, solvents, gasoline, paint thinners, or insecticides on the unit or near the unit. Vapors from these types of chemicals can damage the tape media components.
- Do not expose the unit to moisture or store unit in temperatures higher than 60 °C (140 °F), or to extreme low temperatures. See "Specifications" on page 16 for operating temperatures.

- Keep the unit away from direct strong magnetic fields, excessive dust, and electronic or electrical equipment that generates electrical noise.
- Hold the AC power plug by the head when removing it from the AC source outlet; pulling the cord can damage the internal wires.
- Use the unit on a firm, level surface free from vibration. The unit is designed for other Libraries to be stacked on top of it (up to three). It is not recommended that you place any other objects on top of the unit.

Protective Devices

The Library is equipped with the following protective devices:

- Mechanical Lock
- Front Power Switch

Mechanical Lock

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

Front Power Switch

Switching off the Front Power Switch removes power from the electronics which causes the picker to stop immediately. This switch also removes power from the drives.



CAUTION: The front power switch functions as a power interrupt only. To completely remove all power, disconnect the AC line cord from the electrical source. (C031)

Performing the Safety Inspection Procedure

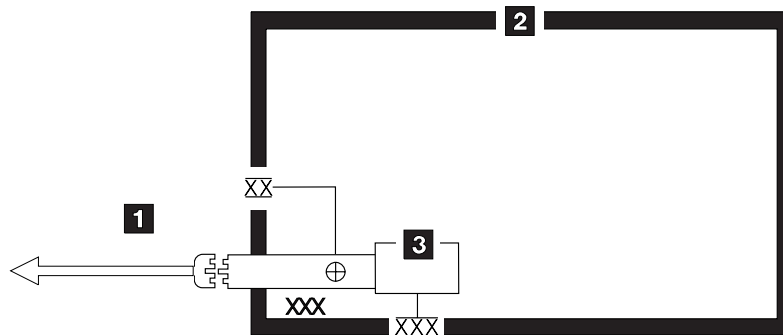
Before you service the 3582 Tape Library, perform the following safety inspection procedure:

1. Stop all activity on the SCSI bus.
2. Turn off the power to the library.
3. Disconnect the SCSI cable and check the SCSI bus terminator for damage.
4. Unplug the library power cord from the electrical outlet.
5. Check the library power cord for damage, such as a pinched, cut, or frayed cord.
6. Check the library SCSI bus (signal) cable for damage.
7. Check the cover of the library for sharp edges, damage, or alterations that expose its internal parts.
8. Check the cover of the library for correct fit. It should be in place and secure.
9. Check the product label on the bottom of the library to make sure it matches the voltage at your outlet.

3582 Library ac Grounding Inspection

1. Power off the library.
2. Disconnect all cables.
3. See Figure 1 which is provided for reference only. Disconnect the power cord from its source.
4. Inspect the power cable for visible cracks, wear, or damage.

- | | |
|----------|--------------------------------------|
| 1 | ac ground |
| 2 | chassis frame |
| 3 | ac ground terminated in power supply |



Legend:

- | | |
|-----|--|
| XX | External tooth lock washer
Green/yellow ground wire terminated to chassis or ground |
| ⊕ | Green/yellow ground wire terminated with slip-on spade terminal |
| XXX | Redundant ground path to frame |
| XXX | External tooth lock washer |

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Figure 1. AC Grounding Diagram (50 Hz and 60 Hz)

End of Life (EOL) Plan

This product 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.

Store this guide with your product's materials.

About This Guide

This IBM TotalStorage® 3582 Tape Library Setup, Operator, and Service Guide is intended to provide information for operators, system administrators, installers, and service personnel. Go to <http://www.ibm.com/storage/lto> for the latest version of this manual.

This guide describes how to install and use the library. It contains the following chapters:

Part 1. Setup Guide

Chapter 1, “Product Description,” on page 3 provides general information about the library and its components.

Chapter 2, “User Interfaces,” on page 19 describes the Operator Panel and explains how to interpret the various icons that can be displayed on the panel. It also explains how to use the Remote Management Unit (RMU).

Chapter 3, “Installation Planning,” on page 33 covers some basic considerations for planning your site, provides sample configurations, and explains how to use the SCSI and Fibre Channel interfaces.

Chapter 4, “Installation Procedures,” on page 43 describes basic set-up procedures, including installing optional hardware.

Chapter 5, “Configuration Procedures,” on page 75 includes instructions for configuring your library using the Setup Wizard.

Part 2. Operator Guide

Chapter 6, “Using the Menus,” on page 95 describes the visual menus and commands executed by the library.

Chapter 7, “Ultrium Media,” on page 163 describes the types of tape cartridges compatible with the library and how to handle these cartridges.

Part 3. Service Guide

Chapter 8, “Troubleshooting and Diagnostics,” on page 187 describes message processing and troubleshooting hints.

Chapter 9, “Removal and Replacement Procedures,” on page 207 describes procedures for the removal and replacement of customer replaceable units (CRUs).

Chapter 10, “Parts List,” on page 235 lists orderable models and features, as well as CRUs for the library.

Part 4. Appendices

Appendix A, “Messages,” on page 243

Appendix B, “Sense Data,” on page 257

Appendix C, “Element Addressing,” on page 269

Appendix D, “TapeAlert Flags,” on page 271

Appendix E, “Connecting to the Serial Port,” on page 275

Appendix F, “Removing a Tape Cartridge,” on page 277

Appendix G, “3582 Configuration Form,” on page 307

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 Tape Library 3582 SCSI Reference*, GA32-0459, gives information about the supported SCSI commands and protocols that govern the behavior of the SCSI interface for the 3582 Tape Library.
- *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 the 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. To order by using File Transfer Protocol (FTP), visit <ftp://ftp.software.ibm.com/storage/devdrv>.
- *IBM Translated Safety Notices*, 96P0851, provides translation of danger and caution notices.

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Chapter 1. Product Description

The IBM TotalStorage 3582 Tape Library is an entry tape library incorporating high-performance IBM TotalStorage LTO Ultrium 3 and Ultrium 2 Tape Drives for the midrange open systems environment.

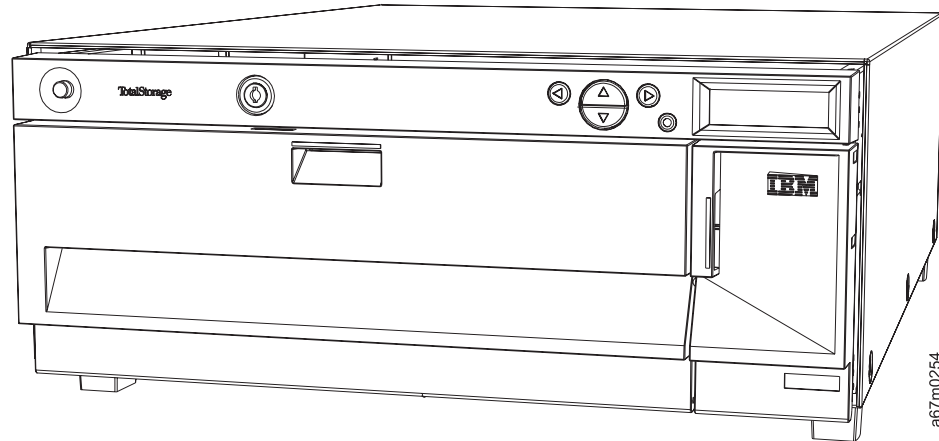


Figure 2. IBM TotalStorage 3582 Tape Library shown in the desktop configuration

The library can accommodate one or two Ultrium 3 and/or Ultrium 2 tape drives and comes standard with a one-cartridge I/O (Input/Output) station and 23 data cartridge slots. With the I/O slot used as a storage slot, this gives a native library capacity of 9.6 TB (19.2 TB with 2:1 compression). Tape cartridge capacity is up to 400 GB (800 GB with 2:1 compression) with the IBM TotalStorage LTO Ultrium 400 GB Data Cartridge and drive performance is up to 80 MB/second native data transfer rate with the IBM LTO Ultrium 3 Tape Drives. The Ultrium 3 Tape Drives come in 2 Gbps switched fabric Fibre Channel and LVD Ultra160 SCSI varieties to attach to a wide spectrum of open system servers.

The library can be configured as a stand-alone unit or can be mounted in an industry-standard 19-inch rack.

The library can be used in network-attached storage implementations, including backups and mass storage archives where multi-terabyte capacities are required. IBM LTO Ultrium technology is designed for the heavy demands of automated tape systems. This proven tape technology has enhanced digital speed matching, power management, channel calibration, servo technology, track layout, head design, error correction codes, and data compression resulting in increased capacity, performance, and reliability in an entry-level, automated tape system.

You can visit the 3582 Tape Library's Web site at <http://www.ibm.com/storage/lto> for additional information not included in this manual.

Standard Features

- **Operator Panel.** The Operator Panel, located on the right above the I/O slot, provides an easy-to-read bitmap display and a five-button keypad that enables you to monitor and control the operations of your library. The liquid crystal display (LCD) provides access to library status, commands, setup, and tools. See “Front Panel Components” on page 6 and “Operator Panel” on page 19 for more information.
- **Robotic system (Picker).** The picker is the tape cartridge handling mechanism that responds to commands from the application software to move the cartridges between the storage slots, tape drives, and the I/O slot.
- **Multi-Path architecture.** Multi-Path architecture allows partitioning which enables you to create logical libraries within a single library. Separate host applications can be run for each logical library.
- **I/O slot.** The I/O slot enables you to import and export cartridges to any slot or drive without unlocking the media access door. See “Interior Components” on page 8 for more information. You can also configure the I/O slot to act as a data storage slot.
- **Magazines.** Removable cartridge magazines allow you to easily insert and remove seven tape cartridges.
- **System integrity.** The cartridge storage slots and robotic system are protected by a door that is lockable by key. Your library can also be configured for password access.
- **Cartridge inventory.** Whenever you power up your library, it will perform a physical inventory of cartridge storage slots.
- **Bar Code Scanner.** The Bar Code Scanner reads bar code labels and presents label IDs to the Operator Panel and the host without losing storage capacity.
- **Manual cartridge use.** Individual cartridges can easily be transported to the library by manually opening the I/O door and inserting the cartridge into the I/O slot. The Operator Panel is then used to load the cartridge into another slot.
- **Reverse cartridge protection.** The magazines, I/O slot, and rear storage slots employ a design that prevents the cartridges from being inserted incorrectly.
- **Built-in diagnostics.** Your library includes diagnostic firmware that reports diagnostic results and drive operating status. Your library also includes real time monitoring of data locations and several types of diagnostic tests.
- **AutoClean.** AutoClean enables the library to automatically clean the drives when cleaning is required.
- **Error diagnosis.** Your library includes an Error Log that is accessible from the Operator Panel. An output log, available through the serial port, contains errors, diagnostic messages, and events.
- **Power Management.** The tape drives enter sleep mode when neither reading or writing data.

Optional Features

- **Additional drive.** You can add an additional drive to your library, increasing data access throughput.
- **Control path failover.** Control path failover enables the host device driver to resend a command to an alternate control path for a logical library either to overcome a command failure or to circumvent timeouts that would otherwise interrupt processing.
- **Data path failover.** Data path failover provides a failover mechanism in the IBM device driver, which enables you to configure multiple redundant paths in a SAN environment.
- **Magazine and dust cover.** Extra magazine and snap-on dust cover and interlocked stacking for offline media storage.
- **Rack Mount Kit.** Your library can be easily converted to a rack mounted configuration. The available Rack Mount Kit can be installed on any library.
- **Remote Management Unit (RMU).** Your library can be equipped for an RMU, which provides remote host operation through a Web browser.

Instructions for installing these features can be found in “Step 4. Install Optional Hardware” on page 59.

Front Panel Components

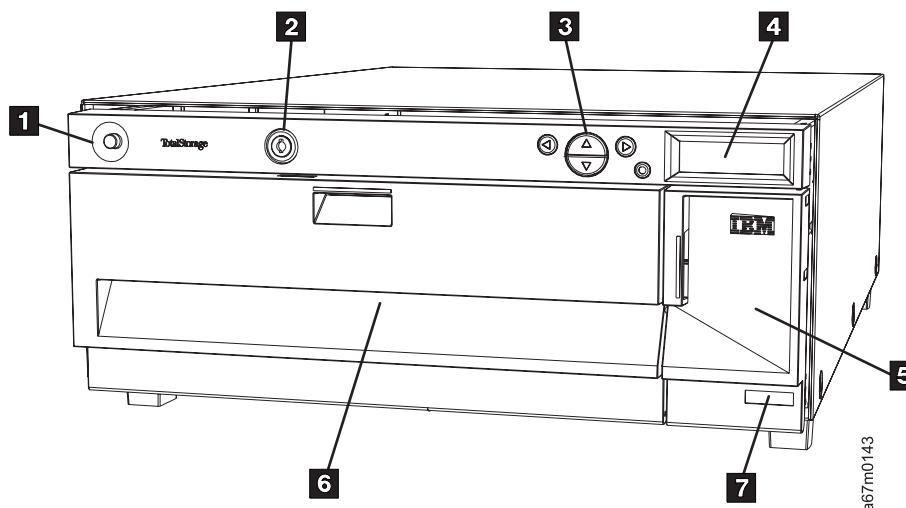


Figure 3. Front view of library

Item Number	Item Name	Item Description
1	Power button	Push button that turns power to your library on and off.
2	Key lock	Lock that prevents unauthorized media insertion and removal.
3	Operator panel keypad	The keypad enables you to view the operational status of the library, perform system configuration, and execute commands.
4	Operator panel LCD	The LCD provides an easy-to-read bitmap display with backlighting.
5	I/O door	Door for access to the I/O slot. The I/O feature enables you to import or export tape cartridges with the media access door locked.
6	Media access door	Door for loading and removing tape magazines. Door can be locked to prevent media insertion and removal.
7	Serial Number	Identification number for your library.

Rear Panel Components

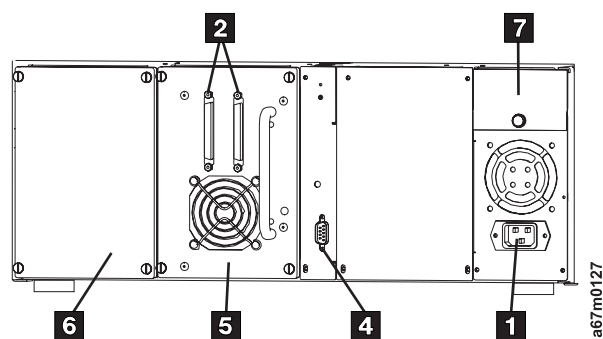


Figure 4. Rear view with a SCSI drive

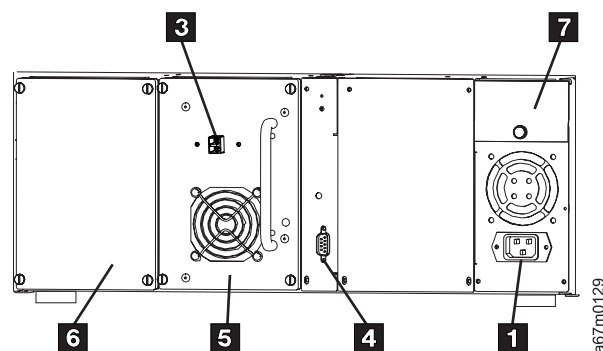


Figure 5. Rear view with a Fibre Channel drive

Item Number	Item Name	Item Description
1	AC power receptacle	Receptacle for AC power cord
2	SCSI connectors	Connections for the interface cable that connect the unit with the host computer or other devices on the SCSI channel (including other library units). The interface cable can be attached to either connector.
3	Fibre Channel connector	Connection for the Fibre Channel interface cable that connects the unit with the host computer.
4	Serial connector	Bidirectional RS-232 port for diagnostic purposes and firmware upgrades.
5	Drive	The library comes equipped with one tape drive unless you order an additional drive.
6	Tape Drive Bay	Tape drive bay for adding a second tape drive.
7	RMU slot	Slot for optional, user-installable RMU that enables remote access to the library using a Web browser

Interior Components

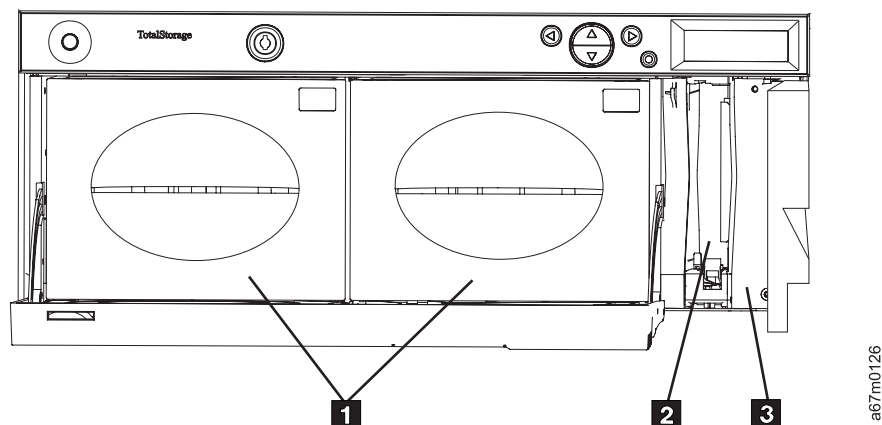


Figure 6. Front view of interior of library

Item Number	Item Name	Item Description
1	Magazines	Removable cartridge magazines allow for the easy insertion and removal of tape cartridges. The magazines include transparent windows that enable you to view media easily. The magazine handle is designed to allow for single-handed magazine installation and removal. When not in use, magazines can be stacked for easy storage.
2	I/O slot	Located behind the I/O Door. Enables insertion and ejection of cartridges without interrupting the normal operation of the library.
3	Bar Code Scanner	Bar code Scanner that reads bar code labels and presents label IDs to the Operator Panel and the host.

Note: Nine fixed cartridge slots (**5** in Figure 7 on page 9) are behind the magazines.

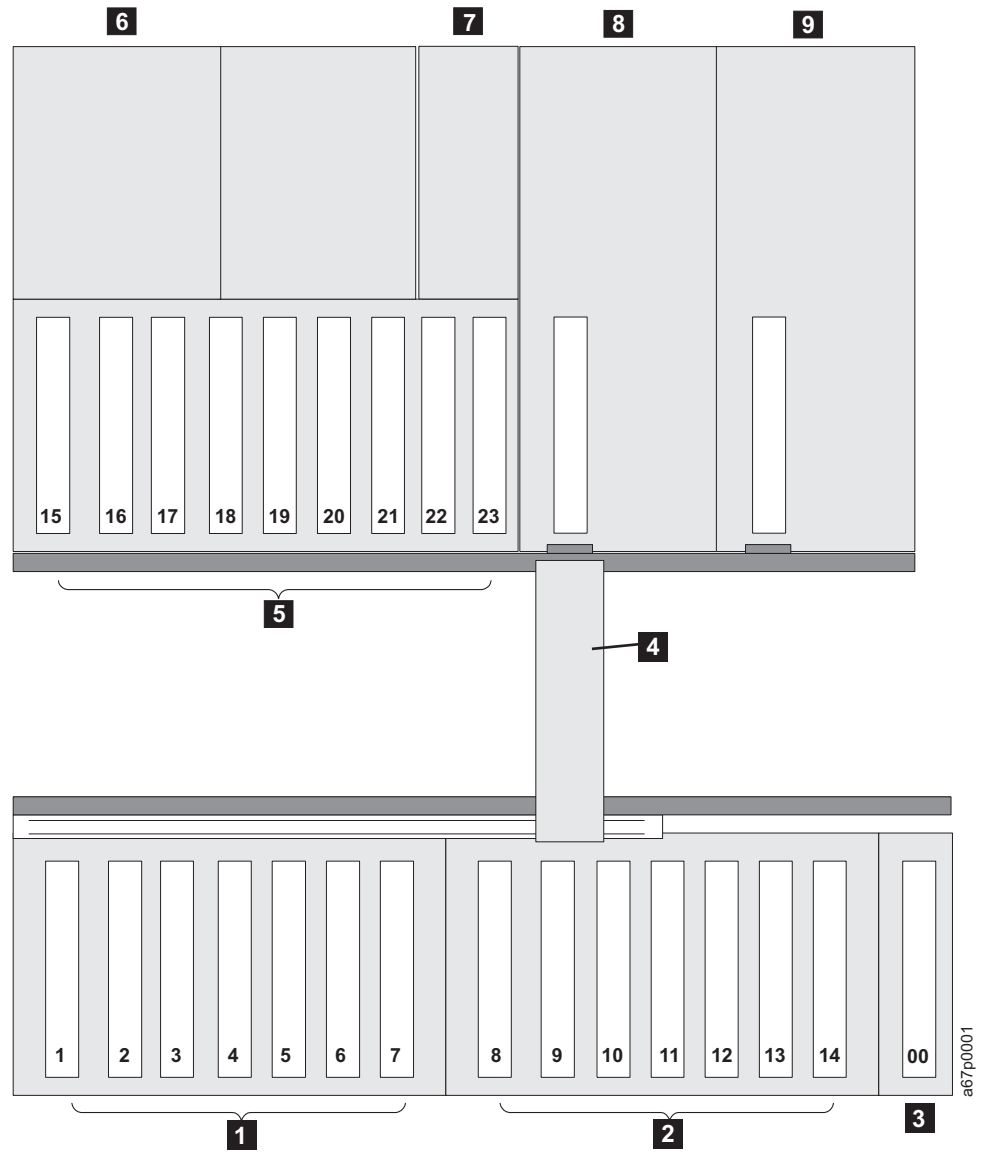


Figure 7. Graphical representation of interior of library

1	Magazine 1	6	RMU slot
2	Magazine 2	7	Main Controller Board
3	I/O Slot	8	Drive 1
4	Picker	9	Drive 2
5	Rear fixed slots		

Tape Drive Performance

Table 1. Performance characteristics of the Ultrium 3 and Ultrium 2 Tape Drives

Performance Characteristic	Tape Drive	
	Ultrium 3 Tape Drive	Ultrium 2 Tape Drive
Native sustained data rate	80 MB/s (with Ultrium 3 media)	35 MB/s (with Ultrium 2 media)
	35 MB/s (with Ultrium 2 media)	20 MB/s (with Ultrium 1 media)
Compressed data rate (at 2:1 compression)	135 MB/s (with Ultrium 3 media)	70 MB/s (with Ultrium 2 media)
	70 MB/s (with Ultrium 2 media)	40 MB/s (with Ultrium 1 media)
Maximum sustained data rate (at maximum compression)	135 MB/s (LVD) 150 MB/s (FC-2)	107 MB/s (LVD) 37 MB/s (HVD) 110 MB/s (FC-2)
Burst data rate	160 MB/s (LVD) 200 MB/s (FC-2)	160 MB/s (LVD) 200 MB/s (FC-2)
Nominal load-to-ready time	15 seconds	15 seconds
Nominal unload time	15 seconds	15 seconds
Average search time to first byte of data	47 seconds	49 seconds
Note: All sustained data rates are dependent on the capabilities of the interconnect (for example, an UltraSCSI bus is limited to less than 40MB/sec).		

By using the built-in data-compression capability of the tape drives, you can achieve greater data rates than the native data transfer rate. However, the actual throughput is a function of many components, such as the host system processor, disk data rate, block size, data compression ratio, SCSI bus capabilities, and system or application software.

Speed Matching

To improve system performance, Ultrium 3 and Ultrium 2 tape drives use a technique called *speed matching* to dynamically adjust native (uncompressed) data rate to the slower data rate of a server.

Media Compatibility

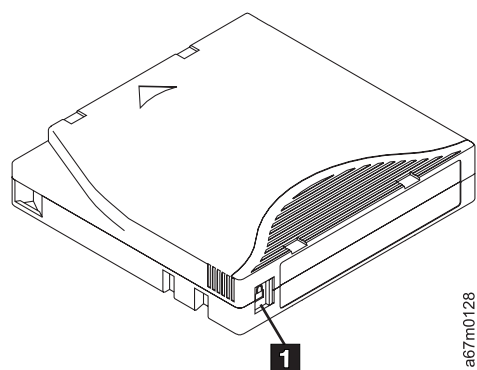


Figure 8. LTO data cartridge

Table 2. Ultrium data cartridge compatibility with Ultrium tape drives

IBM Ultrium Tape Drive	IBM TotalStorage LTO Ultrium Data Cartridges			
	400 GB WORM (Ultrium 3) ¹	400 GB (Ultrium 3)	200GB (Ultrium 2)	100GB (Ultrium 1)
Ultrium 3	Read Once/Write Many	Read/Write	Read/Write	Read only
Ultrium 2			Read/Write	Read/Write
Ultrium 1				Read/Write
¹ See “WORM (Write Once, Read Many)” on page 165 for detailed information on Write Once, Read Many (WORM) support.				

The write-protect switch **1** is used to prevent recording over existing data. To prevent recording or deleting, slide the write-protect switch to the closed position. The drive senses the position of the switch and will not allow writing in this position. When inserting cartridges in the library, slide the switch to the open position, unless you do not want to record on a specific cartridge.

Note: Store data cartridges in a dry, cool environment.

Attention

Never reset or power down your computer or library while a function is in process or a cartridge is moving.

SCSI Attachment

The library operates as a set of SCSI-3 devices. For drives that use a SCSI interface:

- The Ultrium 3 Tape Drive can attach to a server through a Low Voltage Differential (LVD) Ultra160 SCSI interface.
- 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.

Each SCSI drive sled uses shielded HD68 connectors and can attach directly to a 2-byte-wide SCSI cable.

Ensure that:

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

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

For more information about the SCSI interface, see “Using the SCSI Interface” on page 38.

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.

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.

Ultrium Fibre Channel drives offer a 2-Gb interface with 200-MB-per-second, full-duplex, serial-communications technology capable of interconnecting when separated by as much as 10 kilometers (7 miles).

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

For more information about the Fibre Channel interface, see “Using the Fibre Channel Interface” on page 40.

Multi-Path Architecture

The heterogeneous sharing by the multi-path function provides for a sharing of the library robotics. This is accomplished by partitioning the library into up to two multiple logical libraries, and providing each logical library its own separate and distinct drive, storage slots, and control path. Input/output (I/O) slots are shared on a first-come-first-served basis. This type of partitioning allows heterogeneous applications to share the library robotics independent of each other. Cartridges under library control are not shared between logical libraries, nor allowed to be moved between logical libraries. An example of heterogeneous sharing is a Microsoft Windows 2000 application using the drive and storage slots of one logical library while a UNIX application uses the drive and slots of the other logical library.

For additional information, see “Using Multiple Logical Libraries” on page 33.

Control Path Failover

This optional feature provides automatic control path failover to a pre-configured redundant control path in the event of a loss of a host adapter or control path drive, without aborting the current job in progress. Support is provided under AIX and Linux for both SCSI and Fibre Channel attachments when the IBM Atape device driver is used.

For additional information, see “Using Multiple Control Paths” on page 34.

Data Path Failover and Load Balancing

Data Path Failover and Load Balancing exclusively supports native Fibre Channel Ultrium 3 Tape Drives in a 3582 Tape Library using the IBM device driver for AIX and Linux. Data Path Failover is designed to provide a failover mechanism in the IBM device driver, which enables you to configure multiple redundant paths in a SAN environment. In the event of a path or component failure, the failover mechanism is designed to automatically provide error recovery to retry the current operation using an alternate, pre-configured path without aborting the current job in progress. This allows you flexibility in SAN configuration, availability, and management.

For additional information, see “Using Multiple Data Paths” on page 35.

Supported Servers, Operating Systems, and Software

This 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 and a comprehensive list of compatible software, visit the web at <http://www.ibm.com/storage/lto>.

Note:

1. IBM does not provide backup application software with the 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

IBM offers device drivers for the library. Device drivers enable the drive to interact with a variety of servers. To install an IBM device driver properly (if required), refer to the *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430 (included on the Device Driver CD in your shipment or visit <http://www.ibm.com/storage/lto>). For applications that use other device drivers, see the application's documentation to determine which drivers to use.

IBM maintains the latest levels of device drivers and driver documentation for the IBM TotalStorage Ultrium tape products on the Internet. You can access this material from your browser or through the IBM FTP site by performing one of the following procedures. (**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/lto>
 - <ftp://ftp.software.ibm.com/storage/devdrv>
 - <ftp://207.25.253.26/storage/devdrv>
- Using an IBM FTP site, enter the following specifications:
 - FTP site: [ftp.software.ibm.com](ftp://ftp.software.ibm.com)
 - IP Addr: 207.25.253.26
 - Userid: anonymous
 - Password: (use your current e-mail address)
 - Directory: /storage/devdrv

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

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

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

- AIX®
- HPUX
- Linux
- Solaris
- Windows®

Specifications

Dimensions

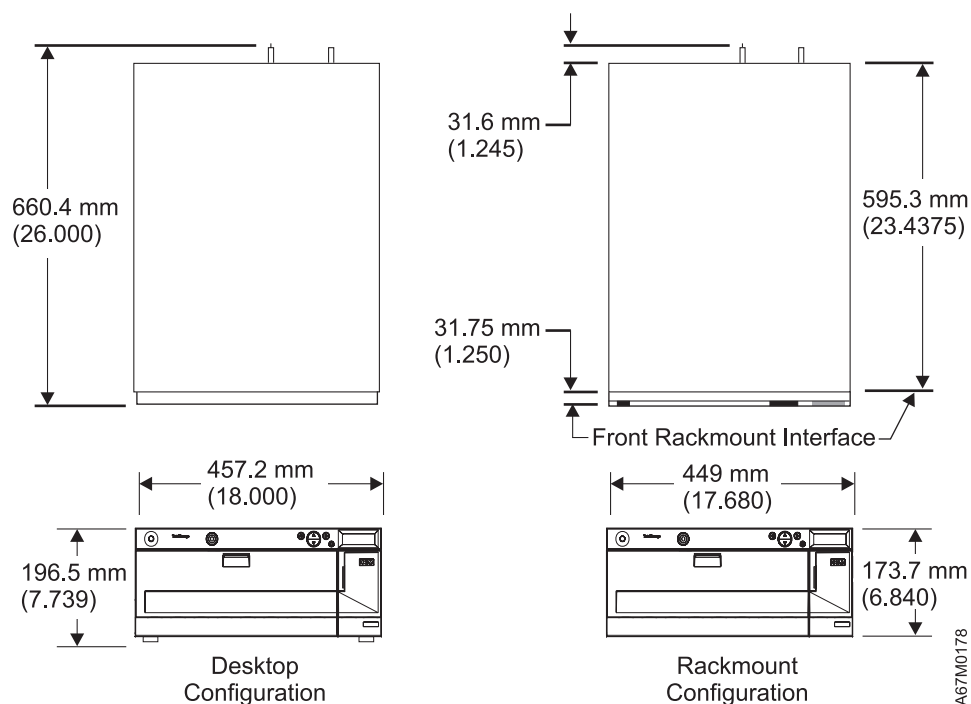


Figure 9. Measurements of the library

Note: Measurements in millimeters (inches).

Weight

Configuration	With Ultrium Tape Drive
Library with one drive	25.4 kg (56 lbs)
Library with two drives	29.9 kg (66 lbs)
Rack mounted Library with one drive	20.8 kg (46 lbs)
Rack mounted Library with two drives	25.4 kg (56 lbs)

Storage Slot Count

Rear cartridge Slots	9
Magazine Slots	7
Magazines per Library	2
Input/Output Slot (configured as a data slot)	1
Total cartridge slots	24

Library Storage Capacity

Media Type	Tape Capacity		Library Capacity	
	Uncompressed	Compressed	Uncompressed	Compressed
LTO Ultrium 3 WORM ¹	400 GB	800 GB	9.6 TB	19.2 TB
LTO Ultrium 3	400 GB	800 GB	9.6 TB	19.2 TB
LTO Ultrium 2	200 GB	400 GB	4.8 TB	9.6 TB
LTO Ultrium 1	100 GB	200 GB	2.4 TB	4.8 TB

¹ See “WORM (Write Once, Read Many)” on page 165 for detailed information on Write Once, Read Many (WORM) support.

Operating Time

Average Cartridge Move Time	13.6 seconds
-----------------------------	--------------

Power

Input Power	4.0 -1.7 amps (rms) at 100-240 VAC, 50/60 Hz (max. configuration)
-------------	---

Thermal Environment

	Power On	Power Off	Storage	Shipment
Temperature (C)	+10°C to +38°C	+10°C to 43°C	1°C to 60°C	-40°C to +60°C
Temperature Variation	10°C/Hr max	10°C/Hr max	10°C/Hr max	10°C/Hr max
Relative Humidity	20% to 80%	10% to 90%	10% to 90%	10% to 90%
Max Temp wet bulb (C)	26°C	27°C	29°C	29°C
Altitude (Meters)	0 to 2500	0 to 2500	0 to 2500	0 to 12192

Acoustic

Designation	Base Library Two Drives, with RMU
Operating LwAu (1)	6.5 Bels
Idling LwAu (2)	6.3 Bels

Notes:

- Operating is defined as exercising both robotic and tape drive components.
- Idle mode is defined as the unit being powered on with no robotic or tape drive action.

Chapter 2. User Interfaces






The library has two user interfaces:

- “Operator Panel”
- Optional “Remote Management Unit (RMU)” on page 24

Operator Panel

The Operator Panel includes an easy-to-read bitmap LCD and a five-button keypad, which lets you control library operations interactively. Using the Operator Panel, you can set library options, check operating statistics, and diagnose errors. The buttons on the keypad are described in more detail below.



Selection	Button	Appears in Text as...	Description
	Left arrow	◀	Navigate menu left
	Right arrow	▶	Navigate menu right
	Up arrow	▲	Scroll value up
	Down arrow	▼	Scroll value down
	Action button		Execute menu option

Icon Definitions

The LCD on the library uses icons to provide graphical representations of menu items. From the Main menu, you can view menu icons as well as drive and cartridge status icons.

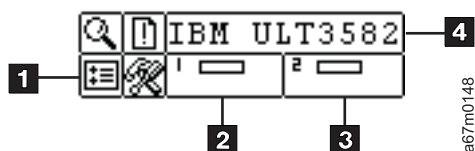
















































Figure 10. Main menu icons

1	Menu icons	3	Drive 2 status
2	Drive 1 status	4	Library status

Menu Icons

Icon	Description	Icon	Description
	STATUS menu		SETUP menu
	Display firmware version		Setup Wizard
	Display inventory		Configure slots
	Display motion counts		SCSI/FIBRE
	Display retry counts		Drive SCSI ID
	Display sensor status		Set Inquiry
	Errors		Access mode
	Serial number		Fibre Channel Loop ID
	WW Name		Configure user interface
	Fibre Status		Timeout
	COMMAND menu		Password
	Import media		Key click
	Import data media		Configure RMU
	Import cleaning media		Configure autoclean
	Export media		Configure scanner
	Export data media		Reset configuration
	Export cleaning media		Enter license
	Dismount drive		TOOLS menu
	Move media		Clean drive
	Bulk load media		Load firmware
	Bulk unload media		Demo test
	Sequential mode		Self test
	Start loop		Drive maintenance

Icon	Description	Icon	Description
	Start single		Manufacturing test
	Stop		Position picker
	Resume		Output logs
			Drive Power On/Off

Drive Status Icons

The following icons indicate drive status and are displayed on the LCD.

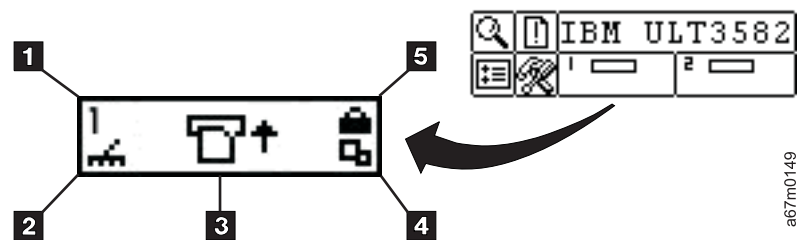


Figure 11. Drive status icons

Icon	Description
1 1 or 2	A tape drive is present in drive slot 1 or 2.
2	Drive cleaning is required.
3	Cartridge activity. See "Tape Activity Icons" on page 22.
3	Drive error message. The character after the ! represents the error indicator on the drive LCD. See "Drive Error Codes" on page 195.
4	The tape drive is compressing data on tape.
5	The cartridge is write protected.

Tape Activity Icons

The following icons indicate cartridge activity and are displayed on the LCD (see **3** in Figure 11 on page 21).

Icon	Description
	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.

Menu Navigation

Tab and scroll to navigate between menus and within a particular menu item. Before beginning the configuration of your library, review “Operator Panel” on page 19).

Main Menu Navigation






You can tab between the four icons (, , , ) in the Main menu (see **1** in Figure 12) by pressing ◀ and ▶. When you have highlighted the menu item that you want to select, press  to select it.



Figure 12. Main Menu Navigation

Submenu Navigation

There are two levels of submenu navigation:

- Level 1: Tabbing
- Level 2: Scrolling

Level 1 (Tabbing) enables movement between the various submenu items (see **1** in Figure 13 on page 23. This type of tabbing works the same as the Main menu

tabbing, using the ◀ and ▶ keys to move between items, and using ⏺ to select items.

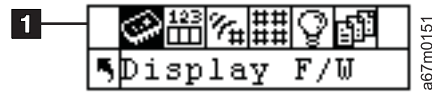


Figure 13. Submenu Navigation

Level 2 (Scrolling) enables movement between the various options associated with a particular submenu item. When scrolling within a submenu item is available, a set of arrows is displayed on the right side of the LCD (see Figure 14). These arrows indicate that more items are available to view or change. Use the ▲ and ▼ keys to scroll through the list or to change the value.



Figure 14. Scroll Arrows

On some screens, more than one item needs to be viewed or changed. A set of scrolling arrows (see 1 and 2 in Figure 15) is associated with each item. Highlight the field, and then use the ▲ and ▼ keys on the keypad to scroll through the list or to change the value. Use the ◀ and ▶ keys to move (tab) between items. The icon called out as 3 in Figure 15 will appear in any storage slot that contains a cartridge.

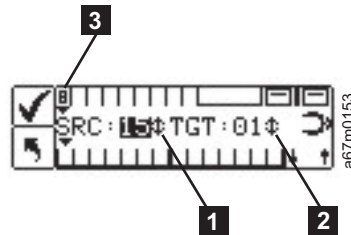


Figure 15. Scrolling Arrows

To exit a submenu and go up a menu level, use the back-to-previous icon (see 1 in Figure 16), indicated by ⏪ on the bottom left of the LCD. Press ◀ to select ⏪, and then press ⏺.

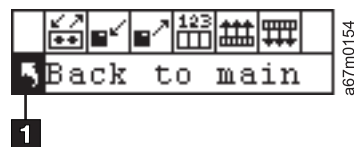


Figure 16. Moving up one menu level

Remote Management Unit (RMU)

The Remote Management Unit (RMU) provides remote access to the 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, you can access many of the functions that are described in Chapter 6, “Using the Menus,” on page 95.

The Operator Panel page of the RMU 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.

RMU Requirements

- Internet Protocol (IP) address
- Subnet mask
- Gateway IP Address
- Web browser

Configuring the RMU

It is strongly recommended that you set up your RMU using the Setup Wizard. Refer to “Setup Wizard” on page 75.

To configure your RMU without using the Setup Wizard, refer to “Configure RMU” on page 116.

Starting the RMU

Before you begin using the RMU, make certain you have configured your RMU with the correct network address.

To start the RMU:

1. Open a Web browser.
2. Enter the RMU IP address in your browser. You can include or exclude any leading zeros. For example, if your IP address is 182.073.056.205 on the Operator Panel, enter “http://182.073.056.205” or “http://182.73.56.205”.
3. Press Enter on your keyboard to display the RMU user interface.

Note: If you select a tab other than the **Status** tab, a login page is displayed. The initial login name is **admin** and the initial password is **secure**. The login name and password are case sensitive.

RMU Interface

Each page of the RMU interface has the following elements:

- **1** Left Navigation Frame
- **2** Center Navigation Frame
- **3** Top Information Frame



Figure 17. Common RMU interface elements

The **left navigation frame** (**1** in Figure 17) contains hyperlinks for logging out of the RMU and for getting help. The links 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.

The **center navigation frame** (**2** in Figure 17) has the tab-style hyperlinks to the following pages:

- "Status Page" on page 26
- "Configuration Page" on page 27
- "Firmware Page" on page 30
- "Diagnostics File Page" on page 31
- "Operator Panel Page" on page 31
- "Logs Page" on page 32

The **top information frame** (**3** in Figure 17) 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.

Status Page

The Status page (see Figure 17 on page 25) displays the current status of the library. From this page you can easily see if there are problems with the system.

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

To check status and obtain general information, click the **Status** tab. The following information is displayed:

Status	What It Means
Library Status	Shows whether the library is online or offline.
Drive Status	Indicates the type and quantity of tape drives in the library.
RMU User	Indicates the name and location of the user.
Hostname	Indicates the hostname used for the RMU connection.
IP Address	Indicates the IP address for the RMU connection.
MAC Address	Indicates the Media Access Control (MAC) address of the RMU. This is also the serial number of the RMU.
Library Serial #	Indicates the library serial number.
SNMP	Indicates whether the SNMP feature is on or off.
SNMP Alerts	Indicates whether the SNMP alert notification feature is on or off.
Library Firmware	Indicates the current level of library firmware.
RMU Firmware	Indicates the current level of RMU firmware.

Login Page

The Status page automatically displays the information under the **Status** tab. However, you must log in before you can view the information under any of the other tabs. A login page (see Figure 18 on page 27) is displayed automatically when you select a tab other than **Status**. The initial login name is **admin** and the initial password is **secure**.

Note: Only one user can be logged into the RMU at a time. The 'admin' user automatically logs off any other user. If a user is currently logged in, that user's name is displayed on the login page.

IBM. TotalStorage™

Logout

Help
Contents
Documentation
SNMP MIB
Support
Version

www.ibm.com

Copyright 2003

Ultrium Tape Library Specialist

Name: RMU (IBM ULT3582-TL)

IBM ULT3582-TL

No Current User.

Enter Login Name

Enter your password

Submit

a67m0207

Figure 18. Login Page

Configuration Page

The Configuration page is protected by a password and allows you to configure the RMU. Network configuration (including SNMP), user configuration (adding users, setting passwords), and date and time setup are all entered on this page (see Figure 19). The initial RMU network configuration is done through the library Operator Panel during library installation and setup (see “Remote Management Unit (RMU)” on page 24).

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Logout

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Ultrium Tape Library Specialist

Name: RMU (IBM ULT3582-TL)

Status Configuration Firmware Diagnostics file Operator panel Logs

Network Configuration

Hostname: RMU

IP Address: 9.11.216.34

Subnet Mask: 255.255.254.0

Gateway: 9.11.216.1

SNMP Configuration

SNMP Enabled: OFF

Alerts Enabled: OFF

Manager: 0.0.0.0

Public Name: public

Private Name: private

User Configuration

Management Action: No Action

User Name: admin

Password:

Re-enter Password:

Date and Time

Date (mm/dd/yy): 00/00/00

Time (hh:mm): 00:00

Synchronization with NTP Server: OFF

NTP Server IP Address: 0.0.0.0

TimeZone: +00:00 [list of timezones](#)

Reboot

[Click here to reboot the RMU](#)

Submit Reset

a67m0208

Figure 19. Configuration page

Network Configuration:

You can reconfigure the hostname, IP address, subnet mask, and gateway address through the RMU.

To reconfigure the network parameters:

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. In the **Network Configuration** area, enter the new hostname, IP address, subnet mask, and gateway address:
3. Click **Submit** and review your changes (indicated in red).
4. To save the new values, enter your password and click **Confirm** to complete the procedure. The new values are saved. Note that you may need to redirect your Web browser.

If you do not want to save the new values, click **Confirm** without entering a password. When the error screen displays, click **Done**. You will be returned to the Status screen.

SNMP Configuration:

Simple Network Management Protocol (SNMP) is a set of protocols used to manage nodes on an IP network. You can configure the RMU to run a SNMP management application.

To configure SNMP:

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. In the **SNMP Configuration** area, do the following:
 - To enable or disable the feature, select **ON** or **OFF** in the **SNMP Enabled** drop-down.
 - To enable or disable SNMP alerts, select **ON** or **OFF** in the **Alerts Enabled** drop-down.
 - In **Manager**, enter the SNMP server address.
 - In **Public Name**, enter the name of the read-only SNMP community.
 - In **Private Name**, enter the name of the read/write SNMP community.
3. Click **Submit** and review your changes (indicated in red).
4. Enter your password and click **Confirm** to complete the procedure. The new values are saved. Note that you may need to redirect your Web Browser.
5. When you are instructed to reboot the RMU, click **Done** to reboot.

Downloading the SNMP MIB File:

The SNMP Management Information Base (MIB) file allows an SNMP management application to understand the SNMP traps generated by the RMU. If you are running an SNMP management application and need the library MIB, you can download it using the RMU.

To download the SNMP MIB file:

1. Click the **SNMP MIB** in the left pane of the RMU interface.
2. Right-click **Download SNMP MIB** and click **Save Target As**.
3. Browse to your SNMP management server and click **Save**. You need to load the MIB file into the SNMP management application.

User Configuration:

You can add unique users to the RMU. Only one administrator account is allowed, which maintains the login of *admin*.

Adding/Removing Users:

Note: Only the *admin* can add or remove users.

To add or remove a user:

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. In the **User Configuration** area, do one of the following:
 - If you are adding a user:
 - a. In the **Management Action** drop-down, click **Create User**.
 - b. In **Edit New**, enter the user name.
 - c. In **Password**, enter the login password and then confirm it in **Re-enter Password**.
 - If you are deleting a user:
 - a. In the **Management Action** drop-down, click **Delete User**.
 - b. In **Select One**, select the user you want to remove.
3. Click **Submit** and review your changes (indicated in red).
4. Enter your password and click **Confirm** to complete the procedure.

Changing a Password:

At any time, you can change your RMU password. If you are the *admin*, you can change users' passwords.

To change a password:

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. In the **User Configuration** area, select **Change User Password** from the **Management Action** drop-down.
3. If not already selected, select the appropriate user account from the **Select One** drop-down.

Note: Only the *admin* can modify another user's password.

4. Click **Submit** and review your changes (indicated in red).
5. Enter your password and click **Confirm** to complete the procedure.

Date and Time:

You can configure the date and time for the RMU. The date and time are used in the RMU log file to report when events occurred.

To configure the date and time:

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. Enter the date and time in the **Date and Time** area.
3. Click **Submit** and review your changes (indicated in red).
4. Enter your password and click **Confirm** to complete the procedure.

Synchronizing with an NTP server:

You can connect the RMU to a network time (NTP) server to automatically set the time.

1. Click the **Configuration** tab and login, if necessary. (When logging in, remember that the user name and password are case sensitive.)
2. In the **Date and Time** area, select **ON** from the **Synchronization with NTP server** drop-down menu.
3. In the **NTP Server IP Address** field, enter the IP address of the NTP server.
4. In the **Timezone** field, enter the time zone deviation for the NTP server. To get a list of time zone variants, click list of **time zones**.
5. Click **Submit** and review your changes (indicated in red).
6. Enter your password and click **Confirm** to complete the procedure.

Firmware Page

The Firmware page (see Figure 20) is protected by a password and allows you to update the firmware of the attached library, the RMU, or the drives in the library.

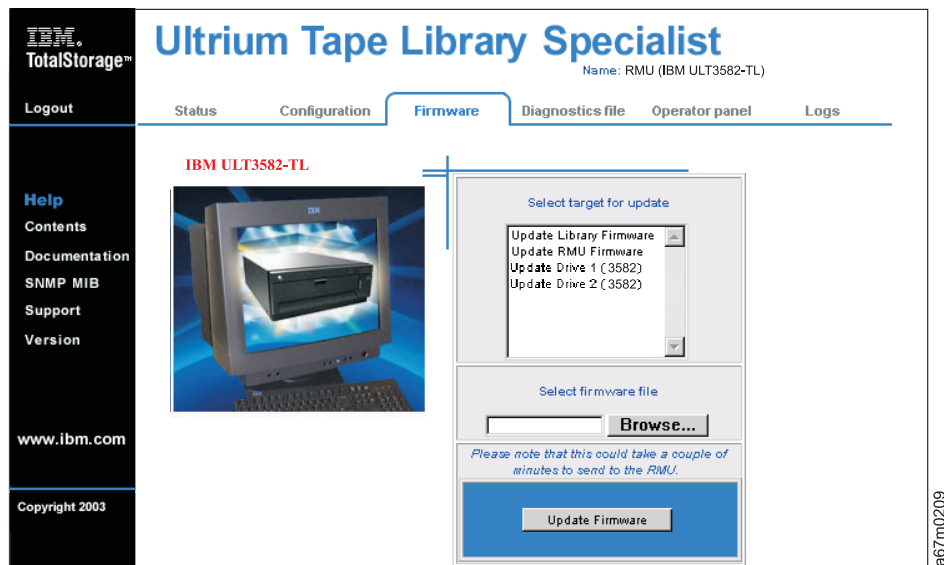


Figure 20. Firmware page

Upgrading Firmware Using the RMU:

Before you update firmware, you need to have the firmware file in a location that is accessible from the RMU interface. Firmware updates can be found at <http://www.ibm.com/storage/lto>.

To update firmware:

1. Click the **Firmware** tab.
2. Select the firmware you would like to update.
3. Click **Browse** and browse to the location of the firmware update file.

Note: Downloading firmware can take several minutes. For details on how long it will take to download firmware, click **some time** above the **Update Firmware** button.

4. Click **Update Firmware**.

If the library was selected for a firmware update, it automatically reboots when the update is complete. If the RMU was selected, you are prompted for a reboot when the update is complete.

Diagnostics File Page

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 21).



Figure 21. Diagnostics file page

From the RMU, you can view the diagnostic information for the attached library and RMU. This information can assist technical support personnel when diagnosing problems.

To view diagnostic files:

1. Click the **Diagnostics file** tab.
2. Select the file you would like to view. The available options are:
 - Library Inventory Report — Provides a physical inventory of the library including drive and slot count.
 - Library Log Report — Provides command, support, and error logs for the library and RMU.
 - Complete Log Report — Provides library inventory information and command, support, and error logs for the library, RMU, and drives.
3. Click **Retrieve selected file**. The file is loaded.
4. Click **Display File** to view the file in a separate browser window.

Operator Panel Page

The RMU provides access to the library using a virtual Operator Panel. It allows you to monitor the activity of the library.

To use the Operator Panel, click the **Operator Panel** tab. The Operator Panel page is protected by a password and is a direct interface to the Operator Panel of the attached library. You can click the softkeys and control the library the same way that you would from the front 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 22).



Figure 22. Operator panel page

Logs Page

The Logs page is protected by a password and shows the last few entries of the library command log (see Figure 23). To view the entire log, download it from the Diagnostics file page (see Figure 21 on page 31).

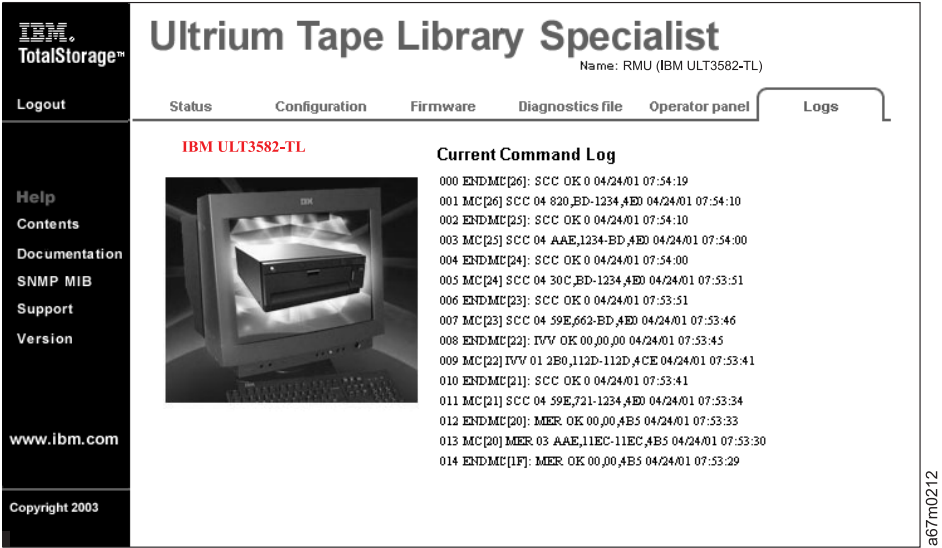


Figure 23. Logs page

You can view the most current entries in the library command log without having to download the entire log file. To view the log, click the **Logs** tab. The command log is displayed with the most recent entry at the top of the list.

Chapter 3. Installation Planning

For best performance of your library, and to minimize the chance of condensation, observe the following site planning guidelines:

- Install your library on a level surface. Do not place the library on a carpeted surface.
- If you expose cartridges to temperatures outside the operating limits, (see “Specifications” on page 16), stabilize them by leaving the cartridges in the operating temperature for a minimum of two hours before using them.
- Avoid temperature problems by ensuring that the library front and rear panels are not obstructed so that the drive has adequate ventilation.
- Position the library where the temperature is relatively stable (that is, away from open windows, fan heaters, and doors).
- Avoid leaving cartridges in severe temperature conditions, for example, in a car standing in bright sunlight.
- Avoid transferring data (reading from and writing to cartridges) when the temperature is changing by more than 10° C (15° F) per hour.

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 library into two logical libraries. Each logical library consists of:

- A tape drive (Ultrium 3 or Ultrium 2)
- 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 “Configure Partitions” on page 105.

When automatic cleaning is enabled, any appropriate cleaning cartridge may be used to clean a drive in any configured logical library. For additional details, see “Configure AutoClean” on page 118.

Using Multiple Logical Libraries for Library Sharing

Multiple logical libraries are an effective way for the library to back up and restore data simultaneously 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 and commands from Application 2 (about Department Y) in Logical Library B. 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 two unique control paths. Thus, the data processing for Department X is confined to the storage slots and drives in Logical Library A and processing for Department Y is confined to the storage slots and drives in Logical Library B.

Using Multiple Control Paths

Command failures and timeouts are costly. Customers want their libraries to run smoothly and efficiently. To ensure continued processing, the 3582 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.

Selected operating system device drivers currently supports this feature. For information, refer to “Control Path Failover” on page 13.

The control path failover feature can be enabled at the factory, or it can be ordered as feature code #1680 and installed later. To order the feature, contact your IBM Sales Representative or any authorized IBM Business Partner. The library serial number is required to order this feature (see “Display Serial Number” on page 148).

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.

For more information about using the control path failover feature, see the *IBM Ultrium Device Drivers Installation and User's Guide*. To add or remove additional control paths, refer to “Set Control Path Failover / Add Control Paths (Access Mode)” on page 110.

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. Table 3 on page 35 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 3. Quantity of drives that are supported per adapter and operating system for iSeries and AS/400 servers

Type of Adapter	Quantity of Ultrium 3 Tape Drives		Quantity of Ultrium 2 Tape Drives	
	OS/400 5.1	OS/400 5.2	OS/400 5.1	OS/400 5.2
HVD	N/A	N/A	1 to 2	1 to 2
LVD	1	1	1 to 2	1 to 2
Fibre Channel	1	1	1 to 2	1 to 2
Note: N/A = not applicable				

Using Multiple Data Paths

When accessing a tape drive device that has been configured with alternate pathing across multiple host ports, the IBM device driver automatically selects a path through the host bus adapter (HBA) that has the fewest open tape devices, and assigns that path to the application. This autonomic self-optimizing capability is called Load Balancing. The dynamic load balancing support is designed to optimize resources for devices that have physical connections to multiple HBAs in the same machine. The device driver is designed to dynamically track the usage on each HBA as applications open and close devices, and balance the number of applications using each HBA in the machine. This may help optimize HBA resources and improve overall performance. Further, Data Path Failover provides autonomic self-healing capabilities similar to Control Path Failover, with transparent failover to an alternate data path in the event of a failure in the primary host-side path. Data Path Failover and Load Balancing for Ultrium 3 Tape Drives requires an optional feature.

For additional information, contact your IBM Sales Representative or Business Partner.

Library Sharing

The 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) prohibit sharing a library between systems. With the 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 application) and multiple homogeneous applications (for example, the same application run by several pSeries servers).

Note: The library can be used as two separate libraries when partitioned; however, the media door when opened does re-inventory both partitions. If a tape is in a drive, it will be moved to the I/O station due to the re-inventory.

From the library's RMU 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 24 on page 37) requires no special capabilities from the server or application. (For more information, see "Using Multiple Logical Libraries" on page 33.)

- 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 24 on page 37). 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 24 on page 37). 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 independent software vendors (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 24 on page 37) requires that you add control paths (see "Using Multiple Control Paths" on page 34). 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 37. Many configurations are possible, and you can design them according to your business needs.

Example Configurations

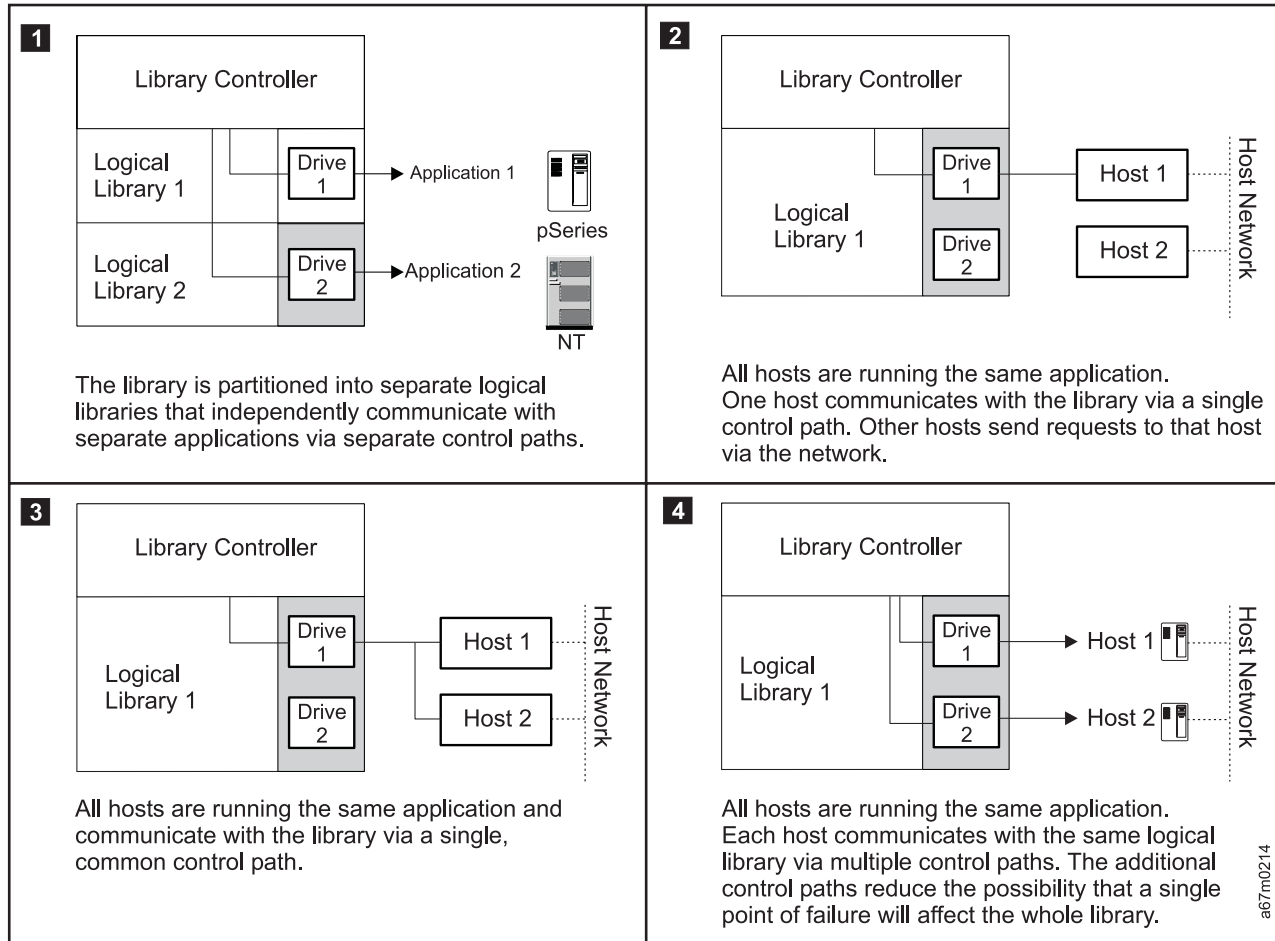


Figure 24. Examples of configurations. Lines from one or more drives to the library controller represent control paths.

Using the SCSI Interface

The library operates as a set of SCSI-2 or SCSI-3 devices. Each SCSI drive sled uses shielded, HD68 connectors, and can attach directly to a 2-byte-wide SCSI cable. The Ultrium 3 tape drive uses an LVD Ultra160 SCSI interface. The Ultrium 2 tape drive uses either LVD Ultra160 SCSI or HVD Ultra SCSI interfaces.

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 4 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 39.

Table 4. 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 39), 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 5 lists the types of SCSI buses and gives the recommended maximum quantity of drives that you can attach.

Table 5. Recommended maximum quantity of drives per SCSI bus

Type of Drive	Type of SCSI Bus			
	Fast/Wide	Ultra	Ultra2	Ultra160/Ultra320
LVD Ultrium 3	N/A (see Note 1)	N/A	N/A	2 (1 drive at 2:1 compression)
HVD Ultrium 2	N/A	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)
Notes: 1. N/A = not applicable.				

Default SCSI ID Assignments

Based on its physical position in the frame, each tape drive is assigned a default SCSI ID. Table 6 lists the default SCSI IDs.

Table 6. Default SCSI ID for each drive in the library

Position	SCSI ID
Drive 1	1
Drive 2	2

Note: You can change a SCSI ID by using the RMU or the Operator Panel. For more information, see “Set Drive SCSI IDs” on page 108.

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 3582 Tape Library 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 “Configure Partitions” on page 105 or “Set Control Path Failover / Add Control Paths (Access Mode)” on page 110).

Using Multiple SCSI Buses

The library has two SCSI connectors for each tape drive in the library. The drives can be daisy-chained using a short SCSI cable.

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.

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 35.

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 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> or, contact your IBM Sales Representative.

Using the Fibre Channel Interface

Ultrium 3 and Ultrium 2 Tape Drives use LC duplex fiber optics cables.

The maximum distances that the 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 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 library Fibre Channel tape drive must have a Fibre Channel Loop ID and corresponding Arbitrated Loop Physical Address (AL_PA) to communicate in a Fibre Channel topology. Table 7 lists the default Fibre Channel Loop IDs and AL_PAs for each drive in the library.

Table 7. Default Fibre Channel Loop IDs and their associated AL_PAs for Ultrium Tape Drives in the library

Drive	Fibre Channel Loop ID	AL_PA
1	17	X'CC'
2	18	X'CB'
Note: Fibre Channel Loop IDs are given in decimal format and AL_PA values are given in hexadecimal format.		

Hard Addressing

You can change a Fibre Channel Loop ID by using the library's Operator Panel or RMU (see "Fibre Setup" on page 111). 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 Fibre Channel Loop ID values range between 0 and 125. The higher the number of the Fibre Channel Loop ID (and AL_PA), the lower the priority of the device in the loop.

Soft Addressing

You can also specify Fibre Channel 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 Fibre Channel Loop ID of 126 or 127.

LUN Assignments

With the Multi-Path architecture, 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 3582 Tape Library 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 “Configure Partitions” on page 105 or “Set Control Path Failover / Add Control Paths (Access Mode)” on page 110).

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 3582 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 Slot 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 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> or, contact your IBM Sales Representative.

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 4. Installation Procedures

Attention

The library is a customer setup unit. It is the customer's responsibility to install this product.

As with all devices, it is recommended that you download the latest level of firmware by visiting <http://www.ibm.com/storage/lto>. Be sure to verify that you have the latest firmware installed on your machine before you contact IBM for any necessary technical support.



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. (D004)

The procedure for installing the library comprises the steps listed below. Step-by-step instructions are given in the sections that follow.

- "Step 1. Unpack Your Shipment"
- "Step 2. Verify Your Shipment" on page 44
- "Step 3. Install as a Desktop or Rack Mount Unit" on page 45
- "Step 4. Install Optional Hardware" on page 59
- "Step 5. Connect the Power Cord" on page 62
- "Step 6. Insert Tape Cartridges" on page 63
- "Step 7. Connect to the Host" on page 67
- "Step 8. Power on Your Library" on page 71
- "Step 9. Configure Your Library" on page 72
- "Step 6. Insert Tape Cartridges" on page 63

Step 1. Unpack Your Shipment

Unpack all items from the carton. Save the packing materials in case you need to move or ship the system in the future.

Attention: You must ship the library in the original or equivalent packing materials or your warranty may be invalidated.

Step 2. Verify Your Shipment

First verify that your shipment contains the parts common to every library.

Every library ships with the following:

- *IBM TotalStorage 3582 Tape Library Setup, Operator, and Service Guide*, GA32-0458
- *IBM TotalStorage 3582 Tape Library Quick Reference*, GX35-5067
- IBM TotalStorage LTO Ultrium Data Cartridge
- IBM TotalStorage Cleaning Cartridge (universal)
- Device Driver Installation Kit that includes:
 - CD that contains Open System device drivers, the IBM Ultrium Device Drivers Installation and User's Guide, and the IBM Ultrium Device Drivers Programming Reference
 - Published copy of the IBM Ultrium Device Drivers Installation and User's Guide

Next verify that your shipment contains the parts particular to your library.

- If you ordered a library with one or two LVD tape drives, verify that you received the following:
 - LVD SCSI wrap tool (Part Number: 19P0481)
 - LVD multi-mode terminator (Part Number: 19P0874)
- If you ordered a library with one or two HVD tape drives (Ultrium 2 only), verify that you received the following:
 - HVD SCSI wrap tool (Part Number: 19P1213)
 - HVD terminator (Part Number: 61G8324)
- If you ordered a library with one or two Fibre Channel drives, verify that you received the following:
 - Fibre Channel wrap plug (Part Number: 11P3847)
- Verify that you received one of the following installation kits:
 - Desktop Kit
 - Rack Mount Kit
 - Host attachment cable
 - Power cord

Step 3. Install as a Desktop or Rack Mount Unit

The 3582 Tape Library ships either with FC 2200, Desktop Kit, for installation as a desktop unit, or with FC 7003, Rack Mount Kit, for installation as a rack unit. For instructions, see

- “Installing the Library as a Desktop Unit”
- “Installing the Library in a Rack” on page 47

Installing the Library as a Desktop Unit

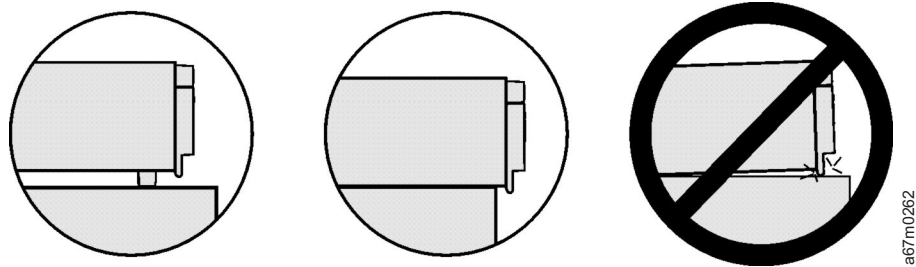


Figure 25. Protecting the front doors of the library from damage

Attention

To avoid damage to the doors on the front of the library, **DO NOT SET THE LIBRARY DOWN ON A FLAT SURFACE WITHOUT FEET INSTALLED.**

Tools and Materials Required

- #1 Phillips screwdriver
- 4 library feet and 8 screws (part number 24R1146)

Note: If you are unable to locate the 4 library feet and 8 screws that were included in your original ship group or that were removed before a rack installation, order Part Number 24R1146 from the IBM Technical Support Center. Visit www.ibm.com/planetwide for the contact information for your country or region.

Verify Shipment Contents

✓	Description
	Protective Plate
	4 silver screws for attaching the Protective Plate
	Decorative Cover
	6 black screws for attaching the Decorative Cover
	Installation Instructions

Prepare to Install the Desktop Kit

1. Remove the desktop unit assembly from the packaging.
2. If the kit is being installed:
 - On a new library, go to “Install the Desktop Kit” on page 46.

- On a library currently installed in a rack, see the following section.

Remove the Library from a Rack

- 1. Power off the library.
- 2. Unplug all cables from the library.
- 3. Loosen the thumbscrews on the mounting brackets on the front of the library securing it to the rack.
- 4. With assistance from another person, secure the library by placing hands on the top and the bottom of the library and slowly pull it out of the rack.
- 5. After the stop plates installed on the back of the library stop it from being pulled out of the rack, tilt the library up to slide it completely out of the rack.

Attention

To avoid damage to the doors on the front of the library, DO NOT SET THE LIBRARY DOWN ON A FLAT SURFACE WITHOUT FEET INSTALLED.

- 6. With assistance from another person, turn the library upside down on a sturdy table.
- 7. Remove the stop plates from the bottom of the library.
- 8. Using a #1 Phillips screwdriver and two longer screws, attach each foot with two longer screws into the pair of round (see **1** in Figure 26), threaded holes located approximately 1 1/2 inches (30 mm) from each corner of the base unit. Be sure the edge of the base unit fits into the notches in the feet.

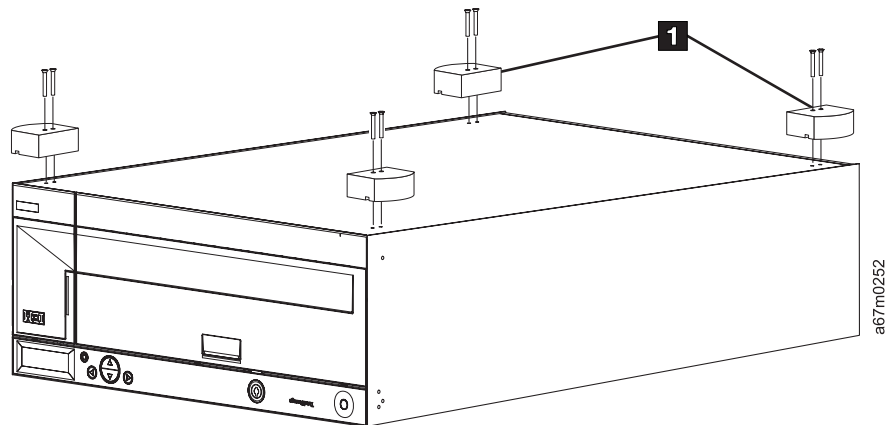


Figure 26. Attachment of Feet

- 9. With assistance from another person, turn the library back over into an upright position.
- 10. Proceed with “Install the Desktop Kit.”

Install the Desktop Kit

In some Desktop Kits, the protective plate is a part of the decorative cover and not a separate part. In this instance, begin installation of the Desktop Kit with Step 3.

- 1. With the raised center portion of the protective plate facing up, place the protective plate on top of the base unit's front plate with the three semicircular cut-outs toward the front of the base unit to reveal the three

screws located there. Align protective plate's screw holes with those on the base unit.

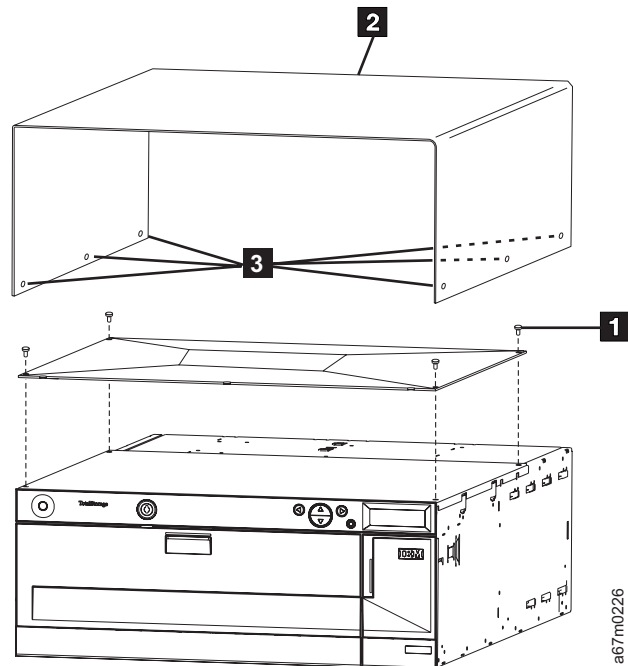


Figure 27. Attachment of protective plate and cover

- ___ 2. Attach the screws through the protective plate into the base unit (**1** in Figure 27).
- ___ 3. Lower the cosmetic cover (**2** in Figure 27) down onto the library. Slightly spread the sides and lower the cover onto the library. Using a #1 Phillips screwdriver, attach the cover by starting the six, small, black screws (3 per side) from the outside of the cover (**3** in Figure 27). Adjust the cover, if necessary, then tighten the screws.
- ___ 4. Proceed to “Step 4. Install Optional Hardware” on page 59.

Installing the Library in a Rack



Danger:

- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinets.
- Rack-mounted devices are not to be used as a shelf or work space. Do not place any object on top of rack-mounted devices.
- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet before servicing any device in the rack cabinet.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.



CAUTION:

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack may become unstable if you pull out more than one drawer at a time.
- *(For fixed drawers)* This drawer is a fixed drawer and should not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack may cause the rack to become unstable or cause the drawer to fall out of the rack.

(R001)

**CAUTION:**

Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building:

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must do the following:
 - Remove all devices in the 32U position and above.
 - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
 - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
 - If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
 - Inspect the route that you plan to take when moving the rack to eliminate potential hazards.
 - Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that came with your rack cabinet for the weight of a loaded rack cabinet.
 - Verify that all door openings are at least 760 x 2030 mm (30 x 80 in.).
 - Ensure that all devices, shelves, drawers, doors, and cables are secure.
 - Ensure that the four leveling pads are raised to their highest position.
 - Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
 - Do not use a ramp inclined at more than ten degrees.
 - Once the rack cabinet is in the new location, do the following:
 - Lower the four leveling pads.
 - Install stabilizer brackets on the rack cabinet.
 - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
 - If a long distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also, lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

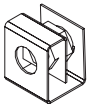


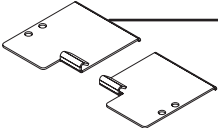
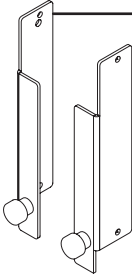
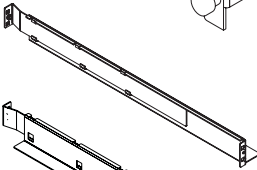
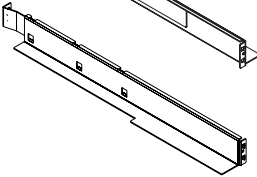

Unpack the Rack Mount Kit

Verify that the rack mount kit you received contains all the parts listed in the table below. Table 8 shows what each of the components in the rack mount kit looks like.

Table 8. Contents of Rack Mount Kit

✓	Part Number	Description	Quantity
	00N8709	M6 Cage Nut (for rack rails with round holes)	2
	12J5288	M6 Cage Nut (for rack rails with square holes)	2
	12J5289	Rack Rail Screws	4
	18P7708	Right Library Stop	1
	18P7709	Left Library Stop	1
	18P7710	Left Mounting Bracket (Library to Rack)	1
	18P7712	Right Mounting Bracket (Library to Rack)	1
	18P8002	Left Rack Rail Assembly	1
	18P8003	Right Rack Rail Assembly	1
	19P4261	M3 x 8 Flat Head Phillips Screws	10

3582 Rack Mount Kit

	PART #	QUANTITY
	00N8709	2
	12J5288	2
	12J5289	4
	18P7708	1
	18P7709	1
	18P7710	1
	18P7712	1
	18P8002	1
	18P8003	1
	19P4261	10 (8 needed, 2 extra)

a67m0228

Figure 28. Rack mount kit parts list

Tools Required

- #1 Phillips screwdriver
- Flat blade screwdriver

Remove the Decorative Cover

If you are converting your library from a desktop unit to a rack mounted unit, complete the following procedure before installing the Rack Mount Kit.

In some Desktop Kits, the protective plate is a part of the decorative cover and not a separate part. In this instance, ignore Step 3.

1. Using a #1 Phillips screwdriver, remove the six, small, black screws (3 per side) from the outside of the decorative cover (**3** in Figure 29).
2. Lift the cosmetic cover (**2** in Figure 29) off the library. Slightly spread the sides and remove the cover from the library.

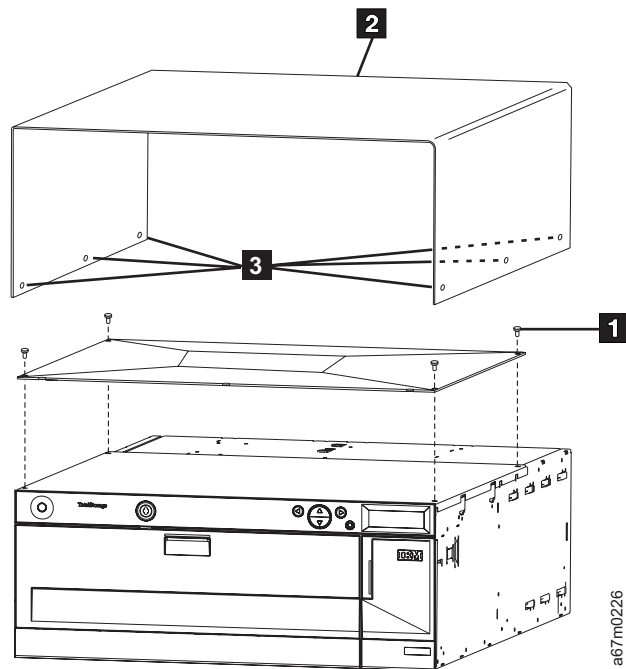


Figure 29. Attachment of protective plate and cover

3. Remove the screws securing the protective plate to the base unit (**1** in Figure 29) and remove the protective plate.

Install the Rack Mount Kit

1. The library requires 4 EIAs of space in a standard 19-inch rack. Ensure that this amount of space is available in the rack.
2. Each rail is labeled with either "Front Right" or "Front Left" relative to your right and left as you face the front of the rack. Remove the piece of tape that prevents the rail extenders from extending unexpectedly.
3. Select the EIA on which you want to rest your library. You must select the topmost hole in this EIA (see **1** in Figure 30 on page 53) for the rails to align evenly with your rack's holes. Insert the front edge of the rail into your rack. Using a #1 Phillips screwdriver, screw the rail to the rack using one Rail Rack Screw (part number 12J5289).

Attention

Support the rail until both ends are secured with screws.

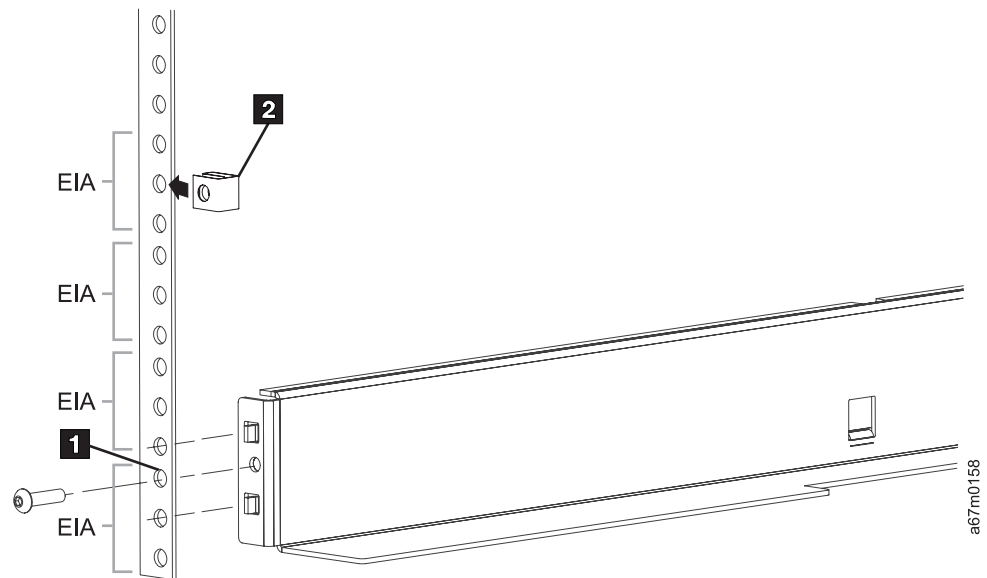


Figure 30. Attaching rails to the front of the rack

Note: Clip-nut (**2**) is referenced in a later step.

- 4. Now screw the rear of the rail to the rack (again using a #1 Phillips screwdriver and a Rack Rail Screw). See Figure 31 on page 54. If the rails fail to reach the back of the rack, extend the rails to the required length.

Attention

Do not exceed the 254 mm (10 inch) extension of rail extenders

- 5. Repeat Steps 3 and 4 to install the other rail.

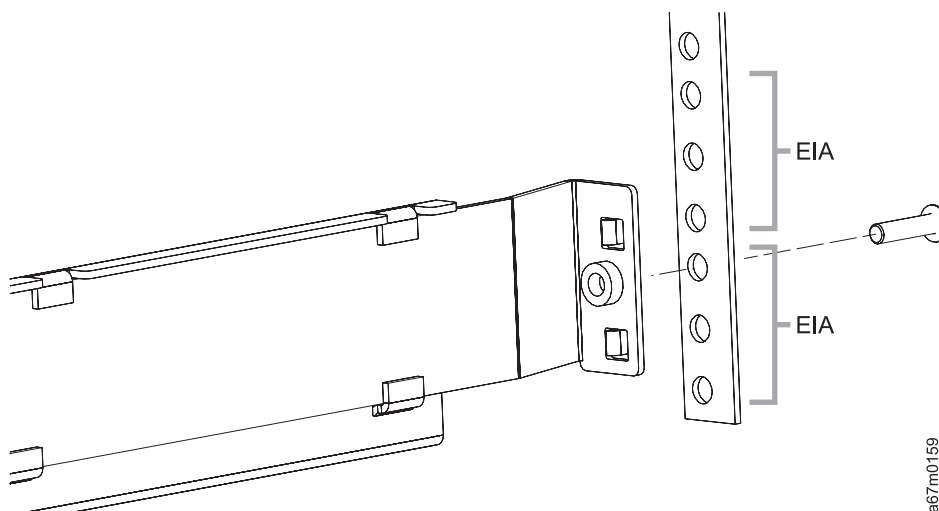


Figure 31. Attaching rails to the rear of the rack

- 6. Tighten all four screws securely because they need to support the weight of your library. Then, compare your rail installation to Figure 32.

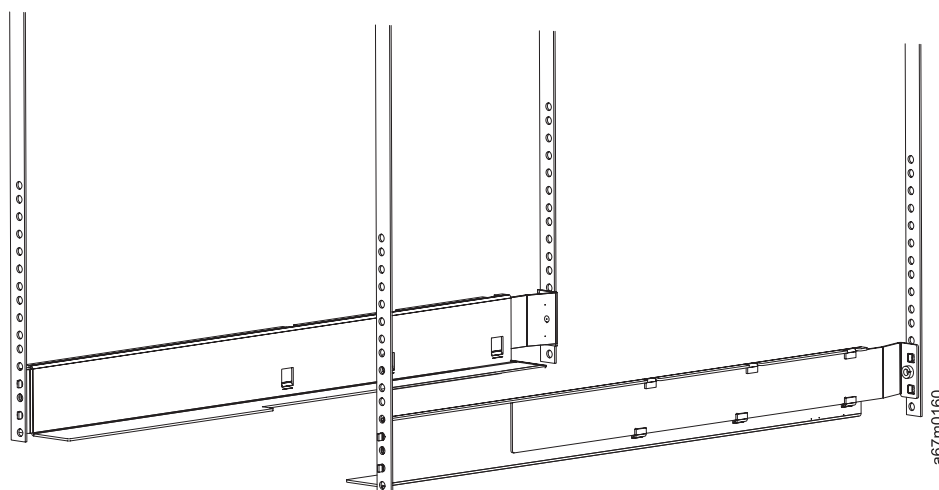


Figure 32. Fully assembled rack mount hardware

- 7. On both front rails in your rack, attach an M6 cage nut into hole **2** in Figure 33 on page 55, which is **eight** holes above hole **1**. A flat blade screwdriver might assist you in snapping the cage nuts to your rack. (An M6 cage nut can be either square or round, depending on the shape of the holes in your rack. The round hole cage nut has part number 00N8709; the square hole cage nut has part number 12J5288.)

Note: The threaded nut must be on the rear surface of the rack rail to prevent it from being pulled out.

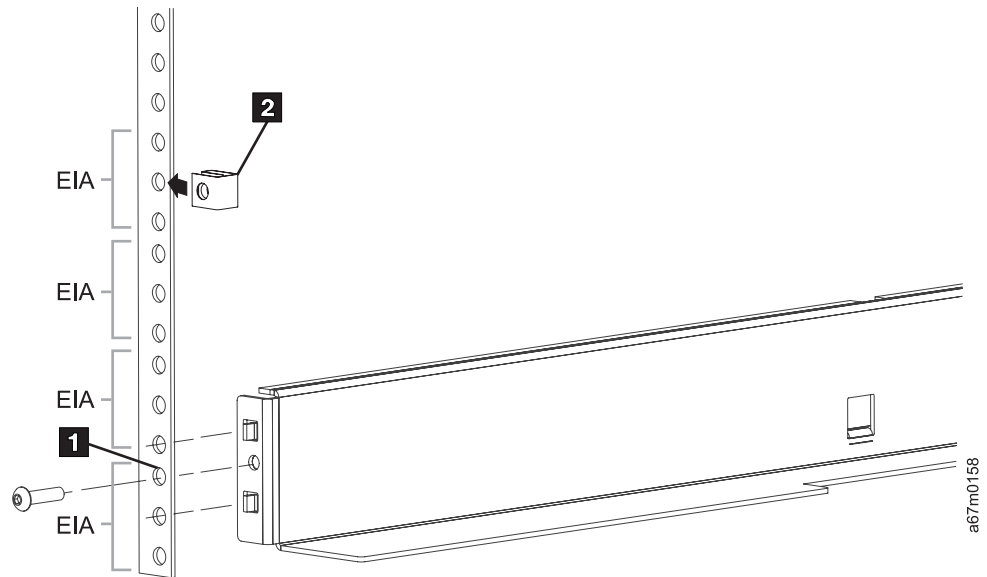


Figure 33. Installing cage nuts on the front rails of the rack

8. Align the library's Right Mounting Bracket (part number 18P7712) at the right front corner of the library, aligning the holes with the second hole from the top of the library and the second hole from the bottom of the library. Attach the bracket using two M3 x 6 flat head Phillips screws (see **1** in Figure 34). Repeat for the Left Mounting Bracket (part number 18P7710), attaching it to the left front corner (this bracket has three holes, one of which is a clearance hole for a screw head).

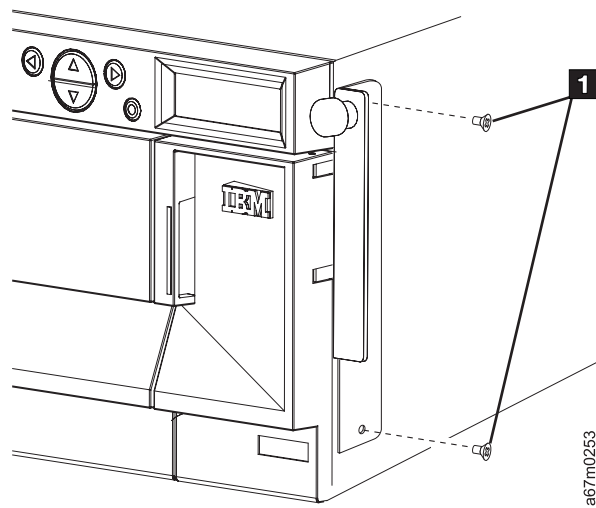


Figure 34. Installing the mounting brackets

9. With assistance from another person, turn the library upside down on a sturdy table.

Attention

Avoid putting any pressure on the front of the library. Do not lift the library by grasping the front and back of the unit. Lift by grasping the sides of the library.

- 10. Remove the four feet (see Figure 35). Save the feet and screws for future installation for converting the library to a desktop unit or for shipping.

Note: If the library is being placed into a higher level in the rack, another option is to remove the front feet after the library is placed most of the way into the rack.

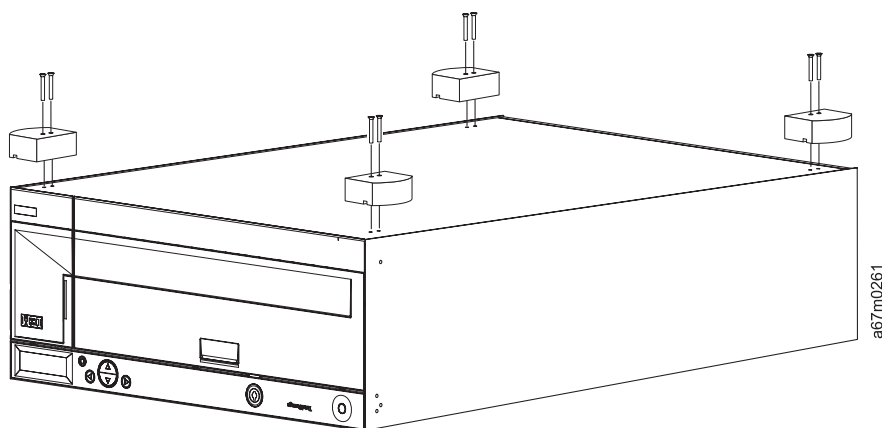


Figure 35. Removing feet from library

- 11. To prevent your library from sliding out the front of your rack, install two stop plates on the rear underside of your library (see Figure 36 on page 57). Position your Right Library Stop (part number 18P7708) and your Left Library Stop (part number 1807709) so that each plate fits snugly into the rear groove of the library's underside and the stop plates' tongues point toward the front of the library. Align each stop plate with the two threaded holes in the library's underside. Screw two M3 x 6 flat head Phillips screws into each stop plate. Tighten the screws to secure the plates. See **1** in Figure 36 on page 57 for the locations to install the stop plates.

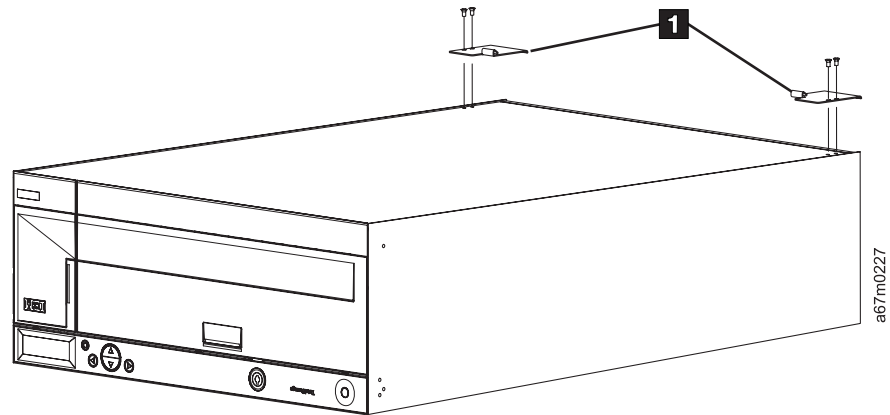


Figure 36. Installing the library stop plates

- ___ 12. With assistance from another person, turn the library right-side up and, without setting the library down, slide the library onto the rack mount hardware until it stops.

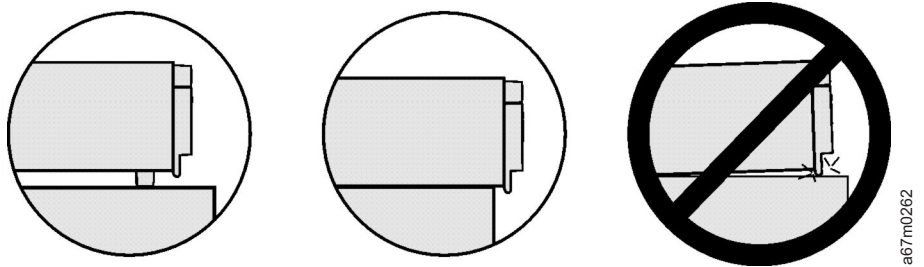


Figure 37. Protecting the front doors of the library from damage

Attention

To avoid damage to the doors on the front of the library, **DO NOT SET THE LIBRARY DOWN** before inserting it into the rack. Support the bottom of the library when sliding it into and out of the rack.

- ___ 13. Attach the securing brackets on the front of the library to both sides of the rack by tightening the thumbscrews on the securing brackets. Figure 38 on page 58 shows the library installed in a rack.

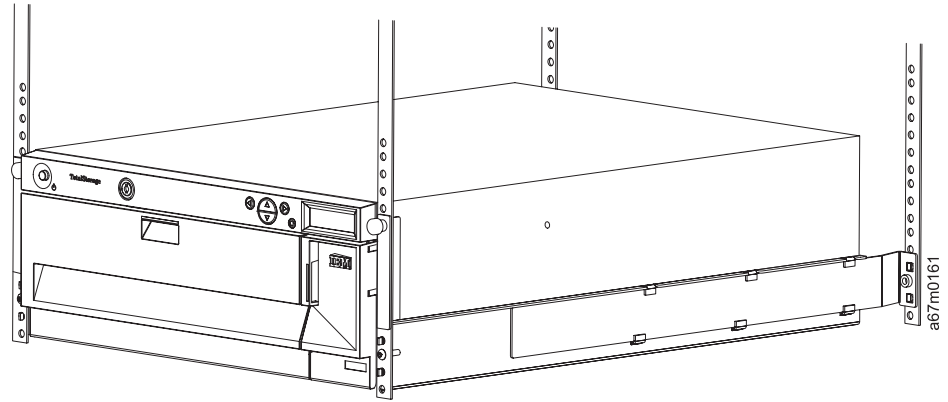


Figure 38. Library in the rack

Step 4. Install Optional Hardware

This section describes how to install the optional hardware. Follow the steps for each optional item you want to install and skip the sections that do not apply to your installation. The optional hardware includes:

- Additional drive
- Remote management unit

Installing an Additional Drive

Your library comes with either one or two drives. If you have one drive, you can install an additional drive by following the procedure below. Your library can contain up to two drives.

Note: This procedure applies for both SCSI and Fibre Channel drives. SCSI drives are shown in Figure 39 and Figure 40 on page 60.

1. Remove the drive module from the packaging.
2. Power off the library and disconnect the AC line cord from the AC source outlet.
3. From the rear of the library, locate the available drive slot. Loosen the four thumbscrews on the cover plate and remove the cover plate. Store the cover plate (see **1** in Figure 39) in a convenient place; it is required for proper operation and cooling of the library if you remove the optional drive.

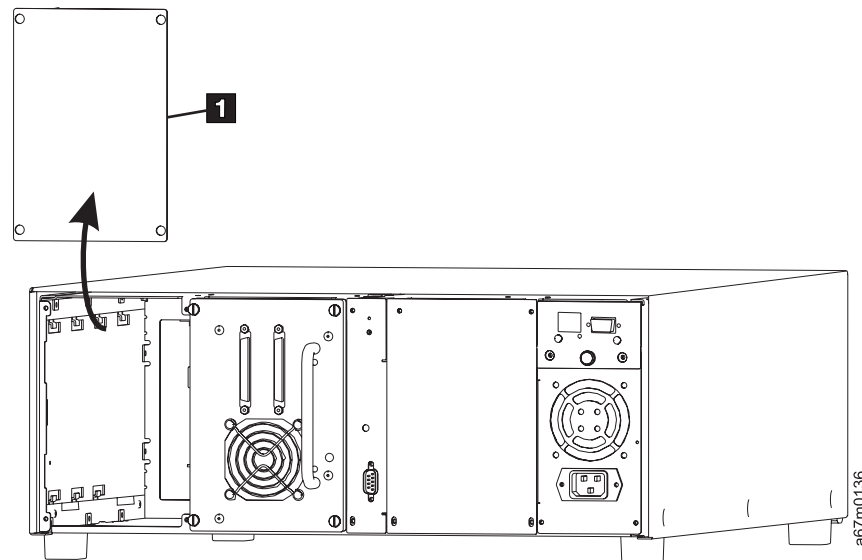


Figure 39. Drive module cover plate removal

4. Slide the drive module into position, being careful to ensure that the metal rails on the drive module are inserted into the plastic guides (both top and bottom) on the left side of the drive bay. If the drive does not slide fully into the bay, withdraw the drive completely and realign it so that the rails align with the slots in the plastic guides.

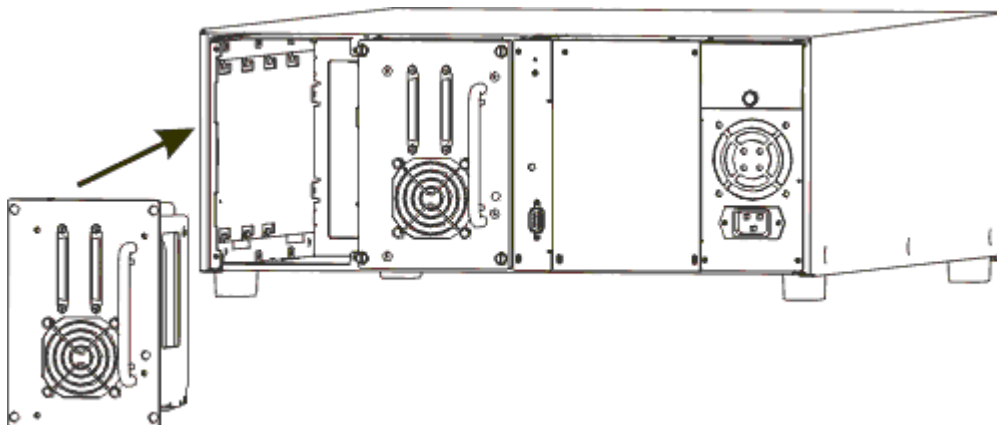


Figure 40. Drive module installation

- ___ 5. Partially tighten the four thumbscrews. Do not fully tighten a thumbscrew before beginning to tighten the other three thumbscrews. Make sure the rear plate is flush with the chassis, then fully tighten all four screws.

Installing the Remote Management Unit

The remote management unit (RMU) allows you to access your library through a Web browser. Follow the procedure below to install the RMU.

- ___ 1. Remove the RMU from the packaging.
- ___ 2. Power off your library and disconnect the AC line cord from the AC source outlet.
- ___ 3. From the rear of the library, locate the available RMU slot. Loosen the thumbscrew on the cover plate and remove the cover plate. Store the cover plate (see **1** in Figure 41) in a convenient place; it is required for proper operation and cooling of the library if you later remove the RMU.

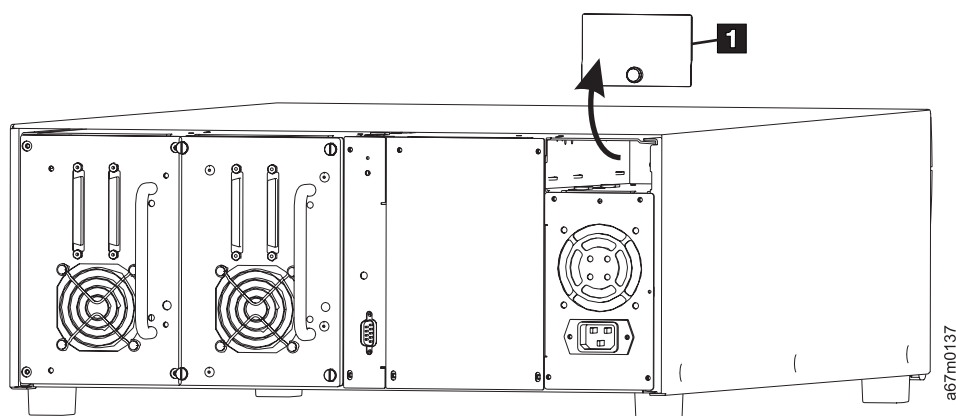


Figure 41. RMU cover plate removal

- ___ 4. Slide the RMU (see **1** in Figure 42 on page 61) into position and tighten the thumbscrew.

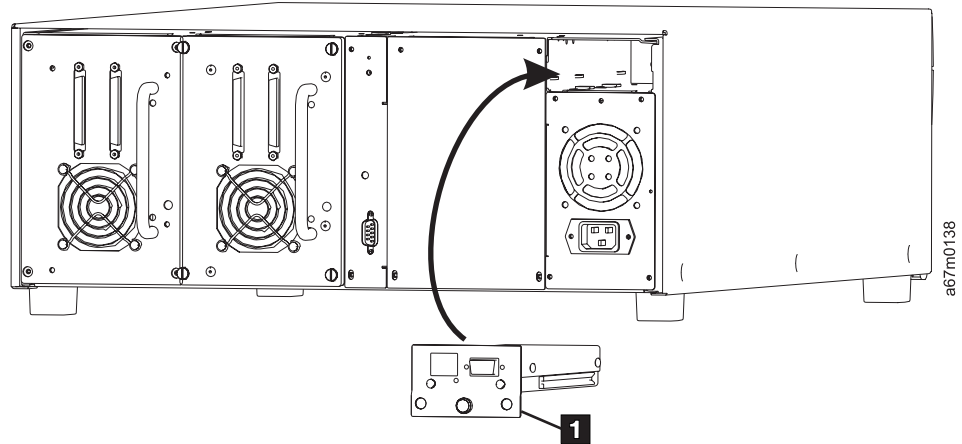



Figure 42. RMU module installation

- ___ 5. Connect the ethernet (RJ45) cable between the library and your Host server or network.

Note: If the ethernet connection is a direct connection between the PC and the library, ensure that a special "crossover" ethernet cable is being used. Otherwise, if the library connection is made to a network hub or switch, ensure that a normal "straight-through" ethernet cable is being used.

Step 5. Connect the Power Cord

Follow the procedure below to connect the power cord to your library.

- 1. Make sure the power switch on the front of the library is off (the  is pressed).
- 2. Plug the power cord (see **1** in Figure 43) into your library.
- 3. Plug the power cord from the library into a grounded electrical socket (see **2** in Figure 43).

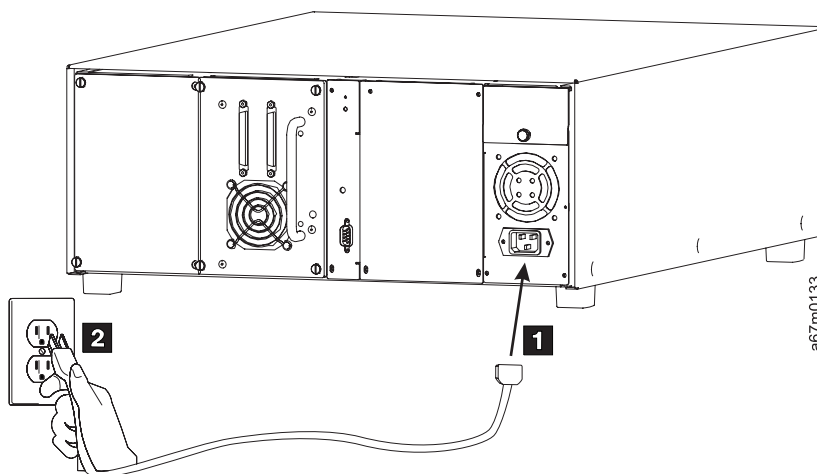


Figure 43. Connecting the power cord (US power outlet shown)

Attention

Ensure that the AC line cord from the library is plugged directly into the socket. Extension cords should not be used.

Step 6. Insert Tape Cartridges

Inspect the cartridges for any shipping damage, such as leader pins out of position (see “Repositioning or Reattaching a Leader Pin” on page 174). Make sure that the write-protect switch is set appropriately on each cartridge. Slide the switch to the appropriate position by pushing it with your finger. For more information, see “Write-Protect Switch” on page 169.

Attention:

It is strongly recommended that all data and cleaning cartridges have a bar code label properly affixed. For more information on bar code labels, refer to Chapter 7, “Ultrium Media,” on page 163.

Follow the procedure below to insert data cartridges.

1. Unlock and open the media access door.

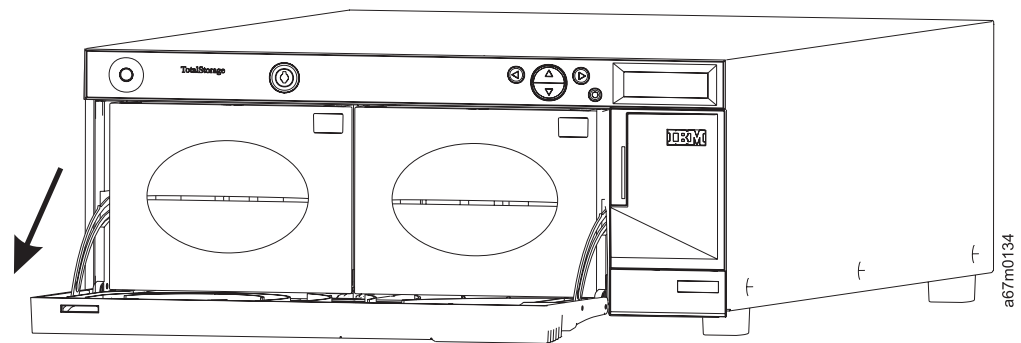


Figure 44. Media access door open

2. Grasp the magazine handle and slide out the magazines.

Note: You might need to pull firmly to remove the magazines.

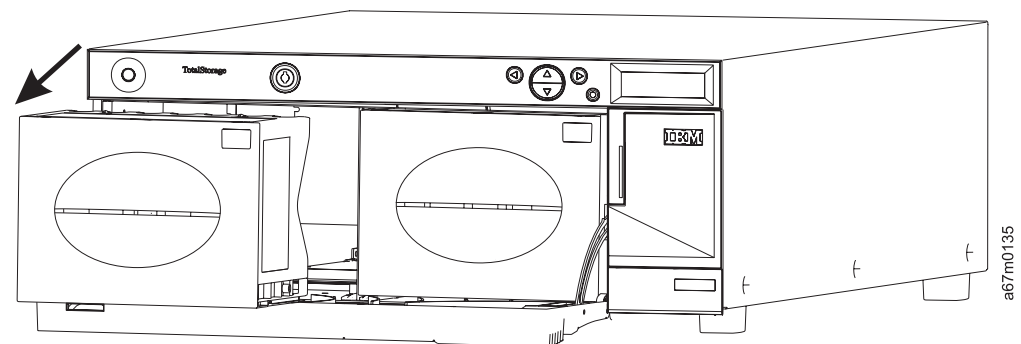


Figure 45. Sliding out the magazines

3. Fill the magazines with cartridges. Ensure that the orientation is correct. The label end of the cartridge goes into the magazine first. The magazine is designed to protect against improper insertion. If the cartridges do not insert easily, do not force them; the orientation is probably incorrect. For more

information on proper media insertion and removal, see “Inserting and Removing Media.”

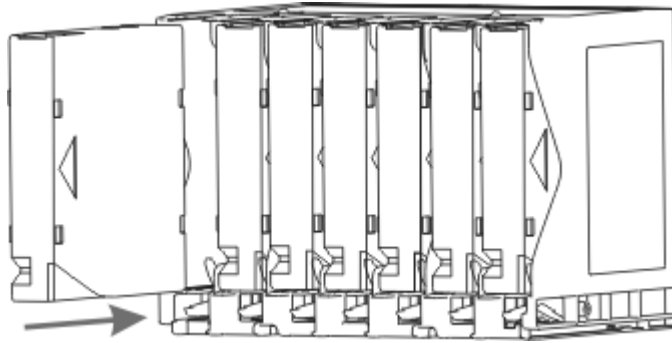


Figure 46. Filling the magazines. The label end of the cartridge is inserted into the magazine first.

- ___ 4. Reinstall the magazines into the library.

Note: You will need to push firmly to fully insert the magazines.

- ___ 5. Close the media access door.
- ___ 6. Refer to “Bulk Load” on page 134 for instructions on loading cartridges from the magazines into the rear slots.

Attention

Prior to power up, the library should be free of any obstruction. Ensure that all cartridges are fully inserted into the storage slots.

- ___ 7. Power up the library.

Inserting and Removing Media

Attention:

It is strongly recommended that all data and cleaning cartridges have a bar code label properly affixed. For more information on bar code labels, refer to Chapter 7, “Ultrium Media,” on page 163.

Your library has been designed to make media insertion a simple and accurate process. There are several ways to insert and remove media from the library:

- Remove the magazines and load them with cartridges. To assist in loading cartridges to the rear slot from the front magazines, you can use the Bulk Load feature in the Command menu.
- Load the magazines with cartridges and use the Bulk Load feature in the Command menu to load cartridges in the rear slots of the library. For more information, see “Bulk Load” on page 134. To remove media, you can unload the cartridges from the rear slots to the magazines by using the Bulk Unload feature in the Command menu. For more information, see “Bulk Unload” on page 136.
- Use the Import/Export features in the Command menu to load cartridges from the I/O slot (**2** in “Interior Components” on page 8). For more information, see “Import Media” on page 124 and “Export Media” on page 128.

Attention: It is not recommended that you manually insert or remove media to or from the rear slots. If you choose to insert or remove media directly to or from the rear slots and the picker is blocking the slots, use the Position Picker tool menu to move the picker. Do not move the picker manually or you might damage it.

Note: Media barcode labels can be viewed through the magazine window.

The magazines and rear storage slots are designed to prevent the cartridges from being inserted incorrectly. The magazines and rear storage slots also include cartridge locks that prevent media from falling out of the slots when the magazines are inverted. To remove the cartridges from the magazine, lift up on the green lever to release the locking mechanism. To remove cartridges from the rear slots use Bulk Unload in the Command menu (see “Bulk Unload” on page 136).









The rear storage slots contain sensors that detect the presence of cartridges and automatically update library inventory when cartridges are inserted or removed. Sensors also detect the presence or absence of the magazines, and the inventory is updated when the magazines are inserted or removed.

Note: If you remove and then reinsert the magazines very rapidly, the sensors might not be able to detect the presence of the magazines. Ensure that you fully insert the magazines and do not remove and reinsert them rapidly.

Attention: Do not directly insert media into the picker. If media is inserted into the picker incorrectly, it might damage the picker.

Manual Removal of Cartridges

You can remove a cartridge manually from a drive, the rear slots, the front magazines, and the picker. You can position the picker to move it out of your way to be able to reach the back interior of your library. You can also position the picker when you want to remove a cartridge from the picker by following the procedure below.

- ___ 1. From the **Tools** menu, press  until  is highlighted, then press .
- ___ 2. Press  or  to select the target slot to move the picker to.
- ___ 3. Press  until  is highlighted, then press .

Removing a Cartridge from a Drive Manually:

- ___ 1. Using the Operator Panel, position the picker to the left, which is away from the drive.
- ___ 2. Open the front door and remove the two magazines.
- ___ 3. Press the eject button on the drive and remove the cartridge.
- ___ 4. If the cartridge cannot be removed, send the drive to IBM to be repaired.

Removing a Cartridge from a Rear Slot:

- ___ 1. Position the picker to the far right. Refer to “Removing a Cartridge from a Drive Manually.”
- ___ 2. Power off the library.
- ___ 3. Open the front door and remove the two magazines.
- ___ 4. Reach into the back of the library and press up on the green lever to release a cartridge from the rear slot.
- ___ 5. Gently pull the cartridge toward you.

Removing a Cartridge from the Picker:

- ___ 1. Position the picker to the far left. Refer to “Removing a Cartridge from a Drive Manually” on page 65.
- ___ 2. Power off the library.
- ___ 3. Open the front door and remove the two magazines.
- ___ 4. If the cartridge is toward you, grasp it and remove it gently. However, if the tape cartridge is away from you, gently push it into a rear slot with a long, narrow object like a ruler.

Note: If a cartridge is partially in the drive and partially in the picker, contact IBM Customer Support for removal instructions.

Step 7. Connect to the Host

This step contains the following sections:

- “Connecting to a SCSI Bus”
- “Connecting to a Fibre Channel Interface” on page 69

Connecting to a SCSI Bus

If your host computer system does not have native SCSI capability and the host adapter you are using is not installed, install it. Refer to the manual that came with your host adapter for specific directions. When the host adapter card is installed, return to this point in the manual.

Check to ensure that the interface cable that you are using has the appropriate connectors on each end. The drives use HD68 connectors on the rear panel.

- If your host computer’s SCSI connector is different from the one on the drives, you will need to obtain an adapter or a different cable.
- The interface cable must be shielded.

Follow the procedure below to connect the SCSI cable and terminator:

1. Connect the SCSI cable to either of the SCSI connectors on the rear panel of the drive (see **1** in Figure 47).
2. Connect the free end of the SCSI cable to the connector on the host computer’s SCSI adapter.

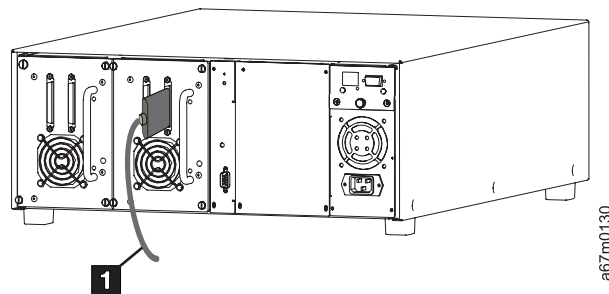


Figure 47. SCSI cable connected to library

3. If you want to connect another drive to the bus, connect an appropriate cable between the remaining SCSI connector on the rear panel of the drive and the next drive.

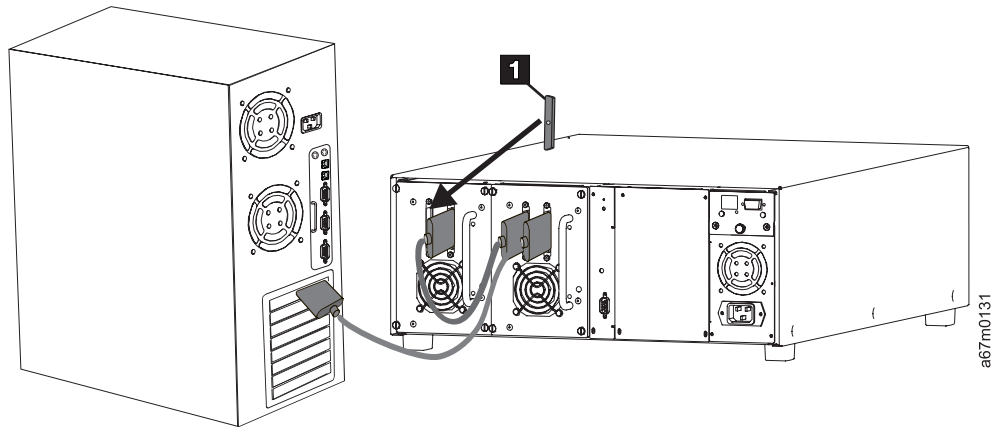


Figure 48. SCSI cable connected to host computer (two-drive library)

4. Terminate the last device in the chain.

Attention: Ensure that you are using the proper terminator and not the wrap tool (see **1** in Figure 48) for your type of SCSI device.

5. Make sure that the SCSI cable between the host adapter and the library is secure and the connections are fastened correctly.

Connecting to More than One Library

If you are connecting more than one library on the same SCSI bus, connect each unit to the previous unit with an additional shielded interface cable (see Figure 49 on page 69). It does not matter which SCSI connector on each library you connect the interface cable to. Make sure that you configure each library unit with unique drive SCSI IDs. Your libraries will not function properly if there are conflicting SCSI IDs.

Note: Ensure that the cable is a HD68 cable and is at least 0.4 meters (15 inches) in length.

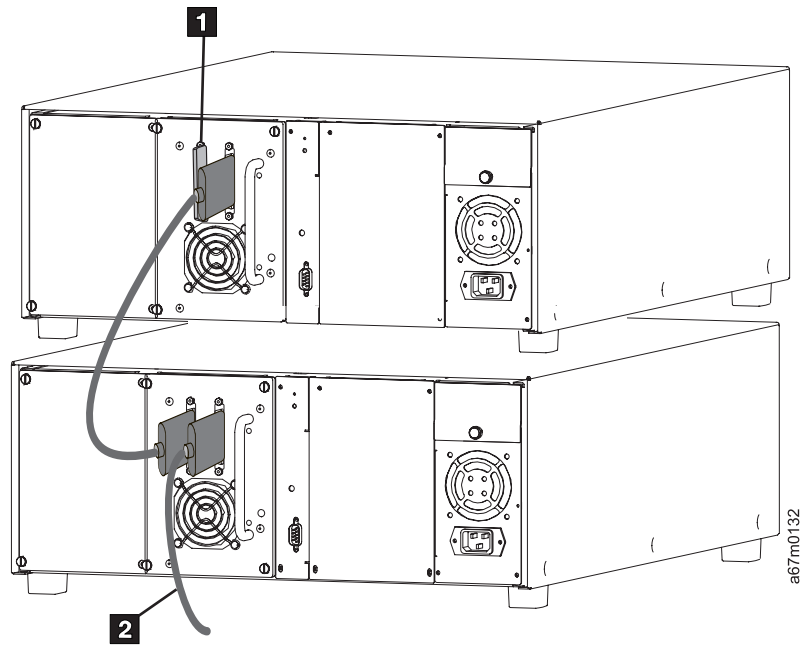


Figure 49. Daisy-chained units

- | | | | |
|----------|------------|----------|---------|
| 1 | Terminator | 2 | To host |
|----------|------------|----------|---------|

Attention

For maximum performance, it is recommended that you do not daisy-chain more libraries together or drives together; otherwise, the data transfer rate will be affected.

Connecting to a Fibre Channel Interface

If your library has a Fibre Channel drive, follow the procedure below to connect the Fibre Channel cable:

1. Connect the Fibre Channel cable to the Fibre Channel connector on the rear panel of the drive.

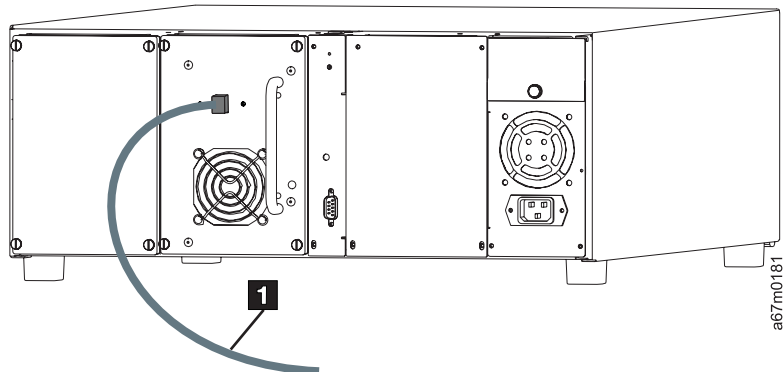


Figure 50. Fibre Channel cable connected to drive

2. Connect the free end of the Fibre Channel cable to the connector on the Fibre Channel switch or the host computer's Fibre Channel adapter.

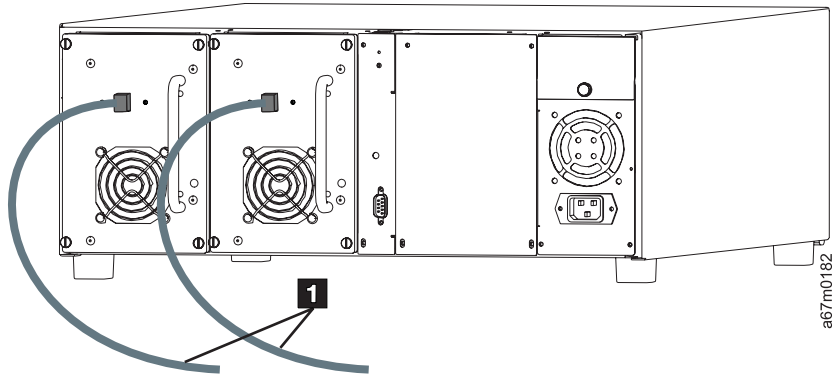


Figure 51. Fibre Channel cable connected to host computer (two-drive library)

3. If you want to connect two drives to the switch or the host computer, repeat steps 1 and 2 for the second drive.

Step 8. Power on Your Library

- ___ 1. Ensure that the power cord is securely plugged in to the rear panel of the library and into the power outlet.
- ___ 2. Push the power button on the front panel of the library.

Step 9. Configure Your Library

Your library provides you with the unique ability to set up the library using a Setup Wizard. The Setup Wizard guides you step-by-step through the setup process ensuring that all elements are configured in the proper order. Refer to “Setup Wizard” on page 75 to use the Setup Wizard.

Attention

Record all settings on the Appendix G, “3582 Configuration Form,” on page 307 as you proceed through the Setup Wizard for future reference.

The RMU stores the VPD settings during the configuration of the library. If the library does not have the RMU, it is important that you write down the configuration settings and store them in a safe place. If for any reason this library is replaced, you will need the original setting to avoid reconfiguring the host application.

Anytime a configuration option is changed, the library must be rebooted (powered OFF, then ON) for the new configuration to take effect.

Your library is shipped with a default configuration that you can use. Table 9 shows the default settings.

Table 9. Default configuration settings

Option	Default Setting	Description
I/O Slot	Input/Output	The host detects one Input/Output (I/O) slot and 23 data slots.
Partitioning	Disabled	The host detects the entire library.
AutoClean	Disabled	The library will <u>not</u> clean the drives automatically when cleaning is required.
SCSI Mode	RND	The host has access to any tape cartridge randomly. Most host software uses this mode.
Drive 1 SCSI ID	1	
Drive 2 SCSI ID	2	
Drive 1 Fibre Channel Loop ID	17	
Drive 2 Fibre Channel Loop ID	18	
Inquiry	ULT3582-TL	The inquiry string returned to the host in a SCSI inquiry command is “ULT3582-TL”.
Timeout Interval	9 minutes	After nine minutes of inactivity on a submenu, the library will return to the Main menu. If a password is set, it must be reentered to access the library.
Password	Disabled	A password is <u>not</u> required to access your library.
Key Click	Disabled	An audible tone is <u>not</u> heard when buttons on the keypad are pressed.
Scanner	Enabled	The bar code scanner scans bar code labels.

Table 9. Default configuration settings (continued)

Additional Control Paths	Disabled	To enable or disable additional control paths, see “Set Control Path Failover / Add Control Paths (Access Mode)” on page 110.
Control Path Failover	Disabled	Requires a separate license key. For information on ordering the appropriate feature code, refer to Chapter 10, “Parts List,” on page 235. To enter the license key that enables this feature, see “Enter Control Path Failover License Key” on page 123. To set control path failover, see “Set Control Path Failover / Add Control Paths (Access Mode)” on page 110.

If you want to change any of these configuration settings, you can either use the Setup Wizard or change them manually using the **Setup** menu. For more information on any of these options or to change the default settings, refer to “Setup Wizard” on page 75 or “Setup Menu” on page 101.

Refer to the instructions in Chapter 5, “Configuration Procedures,” on page 75 to complete the setup of your library.

Chapter 5. Configuration Procedures

To complete the setup of your library, acquaint yourself with the information below on menu navigation, then configure your library using the Setup Wizard.

Menu Navigation

Please review “Menu Navigation” on page 22 before using the Setup Wizard.

Setup Wizard

The Setup Wizard is an easy way to configure your library. You must use the Setup Wizard from beginning to end. If you exit the Setup Wizard before the last step, none of your changes will be saved.




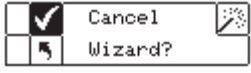




Path: Main Menu → Setup Menu→ Setup Wizard

While the Setup Wizard simplifies the configuration of your library, you can choose to configure your library without it. See “Canceling the Setup Wizard” to bypass the Setup Wizard.

Canceling the Setup Wizard

If you choose not to use the Setup Wizard to configure your library, you can cancel it by following the steps below.




Selection	Description/Result
 Step 1 At the Setup Wizard prompt, press ► to select  , then press  .	Cancels the Setup Wizard.
 Step 2 You will be prompted to cancel the Setup Wizard. Press ▼ to select Do Not Show.	
Step 3 Press ► to highlight  , then press  .	The Setup Wizard will be cancelled. Your settings will not be saved. You will be returned to the initial Setup wizard screen.

Configuring Your Library with the Setup Wizard

To configure your library, follow the steps in one of these sections:




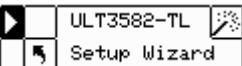

- “Configuring a Partitioned Library”
- “Configuring a Non-partitioned Library” on page 84

At any time, you can select:

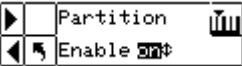




-  to exit the Setup Wizard and cancel changes
-  to move to the next screen
-  to move back to a previous screen

Configuring a Partitioned Library

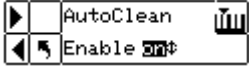

Starting the Wizard:

Selection	Description/Result
 <p>Step 1 From the Setup menu, highlight  then press .</p>	Runs the Setup Wizard.
 <p>Step 2 Press  to begin using the wizard.</p>	

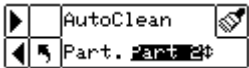

Enabling/Disabling Partitions:

Selection	Description/Result
 <p>Step 3 Press  or  and select on to enable partitioning. Next, press  to highlight the right arrow, then press  to continue to Step 4.</p>	on Library is split into two partitions. The host will be affected (reduced slot) based on which partition it is attached to.

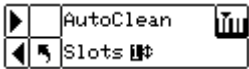

Enabling/Disabling AutoClean:

Selection	Description/Result
 <p>Step 4 Press ▲ or ▼ to enable or disable AutoClean. If you do not enable AutoClean, skip to Step 10.</p>	<p>Available options are:</p> <p>on The library automatically cleans the drives when cleaning is required. Overall slots available for data cartridges are reduced. Host software cleaning features must be turned off.</p> <p>If you select on, the Setup Wizard will proceed to Step 6.</p> <p>off AutoClean is disabled.</p> <p>If you select off, the Setup Wizard will skip to Step 10.</p>
<p>Step 5 Press ►, then , to accept the changes and move to the next option.</p>	

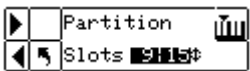

Selecting the Mode for AutoClean:

Selection	Description/Result
 <p>Step 6 Press ▲ or ▼ to select the mode for AutoClean.</p>	<p>Available options are:</p> <p>Both Cleans both partitions.</p> <p>Part 1 Only cleans Partition 1.</p> <p>Part 2 Only cleans Partition 2.</p>
<p>Step 7 Press ►, then , to accept the changes and move to the next option.</p>	

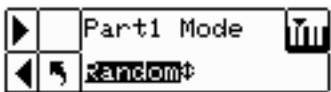

Selecting the Number of Cleaning Slots:

Selection	Description/Result
 <p>Step 8 Press ▲ or ▼ to select the number of cleaning slots you want to configure.</p>	<p>You can allocate up to four slots to be used for cleaning.</p> <p>Slots 20 - 23 can be used as cleaning slots. For more information, see "Configure Cleaning Slots" on page 101.</p> <p>Available sections: 1, 2, 3, 4</p>
<p>Step 9 Press ►, then , to accept the changes and move to the next option.</p> <p>If you did not enable partitioning, skip to Step 16.</p>	

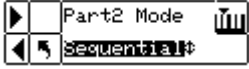

Selecting the Number of Slots for Each Partition:

Selection	Description/Result
 <p>Step 10 If you enabled partitioning, press ▲ or ▼ to select the number of slots for Partition 1 and Partition 2.</p>	<p>The slots in the magazine on the left are always Partition 1 and the slots in the magazine on the right are always Partition 2.</p> <p>You can designate a minimum of 8 slots for each Partition (7 magazine slots and 1 rear slot).</p> <p>You can designate a maximum of 15 slots for Partition 1 or 2 (7 magazine slots, 8 rear slots). When the library is in partitioned mode, the I/O slot cannot be configured as a storage slot. If you configure cleaning slots, the total number of rear slots available will be reduced. See “Configure Cleaning Slots” on page 101 for more information.</p>
<p>Step 11 Press ►, then , to accept the changes and move to the next option.</p>	

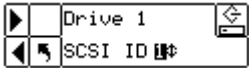

Selecting the Mode for Partition 1:

Selection	Description/Result
 <p>Step 12 Press ▲ or ▼ to select the mode for Partition 1.</p>	<p>Available options are:</p> <p>Random Allows your backup software to access any tape cartridge randomly and access the library on a different logical unit than the drives.</p> <p>Sequential Requires the backup software to write the data to each of the tape cartridges sequentially, starting with the first one. This mode is used if your host only recognizes tape drives and not libraries.</p>
<p>Step 13 Press ►, then , to accept the changes and move to the next option.</p>	

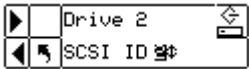

Selecting the Mode for Partition 2:

Selection	Description/Result
 <p>Step 14 Press ▲ or ▼ to select the Mode for Partition 2.</p>	<p>Available options are:</p> <p>Random Allows your backup software to access any tape cartridge randomly and access the library on a different logical unit than the drives.</p> <p>Sequential Requires the backup software to write the data to each of the tape cartridges sequentially, starting with the first one.</p>
<p>Step 15 Press ►, then , to accept the changes and move to the next option.</p>	

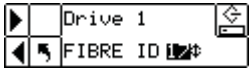

Setting the SCSI ID for Drive 1:

Selection	Description/Result
 <p>Step 16 Press ▲ or ▼ to set the SCSI ID for Drive 1.</p>	<p>If the drive in position 1 in your library is a SCSI drive, you must select a number between 0 and 15. If the drive in position 1 is a Fibre Channel drive, proceed to Step 17.</p> <p>Default: 1</p> <p>SCSI ID 7 is typically reserved for the HBA (host bus adapter).</p>
<p>Step 17 Press ► and then , to accept the changes and move to the next option.</p>	

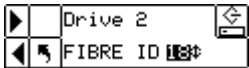

Setting the SCSI ID for Drive 2:

Selection	Description/Result
 <p>Step 18 Press ▲ or ▼ to set the SCSI ID for Drive 2.</p>	<p>If the drive in position 2 in your library is a SCSI drive, you must select a number between 0 and 15. If the drive in position 2 in your library is a Fibre Channel drive, proceed to Step 19.</p> <p>Default: 2</p> <p>SCSI ID 7 is typically reserved for the HBA (host bus adapter).</p>
<p>Step 19 Press ►, then , to accept the changes and move to the next option.</p>	



Setting the Fibre Channel Loop ID for Drive 1:

Selection	Description/Result
 <p>Step 20 Press ▲ or ▼ to set the Fibre Channel Loop ID for Drive 1.</p>	<p>If the drive in position 1 in your library is a Fibre Channel drive, you must select a number between 0 and 126. If the drive in position 1 is a SCSI drive, the ID was set in an earlier step. Proceed to Step 21.</p> <p>Default: 17</p>
<p>Step 21 Press ►, then , to accept the changes and move to the next option.</p>	

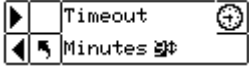

Setting the Fibre Channel Loop ID for Drive 2:

Selection	Description/Result
 <p>Step 22 Press ▲ or ▼ to set the Fibre Channel Loop ID for Drive 2.</p>	<p>If the drive in position 2 in your library is a Fibre Channel drive, you must select a number between 0 and 126. If the drive in position 2 is a SCSI drive, the ID was set in an earlier step. Proceed to Step 23.</p> <p>Default: 18</p>
<p>Step 23 Press ►, then , to accept the changes and move to the next option.</p>	



Setting the Inquiry String:

Selection	Description/Result
 <p>Step 24 Press ▲ or ▼ to set the Inquiry string.</p>	<p>Sets the inquiry string returned to the host in a SCSI inquiry command.</p> <p>Available options are:</p> <ul style="list-style-type: none"> • ULT3582-TL (Recommended) • ULT3583-TL • Scalar 24 • Scalar 100 <p>The other options are available to those users whose host may be having trouble recognizing the library when using the recommended inquiry string. When using an inquiry string other than the one recommended, many menu options will not be available. Only the recommended inquiry string for this library is supported by IBM</p>
<p>Step 25 Press ►, then , to accept the changes and move to the next option.</p>	



Setting the Menu Timeout Value:

Selection	Description/Result
 <p>Step 26 Press ▲ or ▼ to set the number of minutes for the timeout value.</p>	<p>Sets the duration of inactivity on a submenu, which will cause the menu to go back to the Main screen and online state.</p> <p>The timeout window is represented in minutes. You must specify a value between 1 and 9.</p> <p>The default setting is 9 minutes.</p> <p>If you have a password set, after the timeout window has expired, the password will need to be reentered to access the secure menu features.</p>
<p>Step 27 Press ►, then , to accept the changes and move to the next option.</p>	

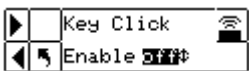

Enabling/Disabling OCP Password Protection:

Selection	Description/Result
 <p>Step 28 Press ▲ or ▼ to enable or disable a password.</p>	<p>Available options are:</p> <p>on The password is required to enter any menu except Status.</p> <p>off Password is disabled.</p> <p>Note: If the password is enabled through the SCSI host, you cannot modify or disable the password using the LCD.</p>
<p>Step 29 Press ►, then , to accept the changes and move to the next option.</p>	<p>If you select on, the Setup Wizard will proceed to Step 30.</p> <p>If you select off, the Setup Wizard will proceed to Step 32.</p>

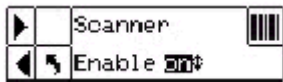

Entering the Password:

Selection	Description/Result
 <p>Step 30 If you enabled a password, set the password by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields. If you did not enable a password, skip to Step 34.</p>	<p>The current field is highlighted. You must select a numeric value between 0 and 9 for all four fields.</p>
<p>Step 31 Press ►, then , to accept the changes and move to the next option.</p>	


Enabling/Disabling Key Clicks:


Selection	Description/Result
 <p>Step 32 Press ▲ or ▼ to enable or disable key clicks.</p>	<p>Available options are:</p> <p>on An audible tone is heard when buttons are pressed on the keypad.</p> <p>off Key clicks are disabled.</p> <p>Recommended: off</p>
<p>Step 33 Press ►, then , to accept the changes and move to the next option.</p>	

Enabling/Disabling the Bar Code Scanner:

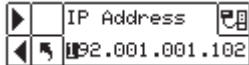

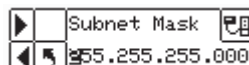

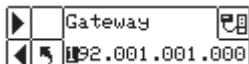
Selection	Description/Result
 <p>Step 34 Press ▲ or ▼ to enable or disable the bar code scanner. If you disable the scanner, skip to Step 40.</p>	<p>Available options are:</p> <p>on All media is scanned for bar codes. Unlabeled or unreadable labeled media generates a user message.</p> <p>off Bar code scanner is disabled.</p> <p>Recommended: on</p>
<p>Step 35 Press ►, then , to accept the changes and move to the next option.</p>	<p>If you select on, the Setup Wizard will proceed to Step 36.</p> <p>If you select off, the Setup Wizard will proceed to Step 38.</p>

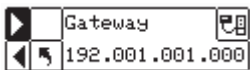
Selecting the Bar Code Scanner Mode:

Selection	Description/Result
 <p>Step 36 Press ▲ or ▼ to select the bar code scanner mode.</p>	<p>Available options are:</p> <p>Default The scanner expects to read and reports to the host six characters. Optional one-or two-character media identifiers can be present but are not reported.</p> <p>Media ID The scanner expects to read and reports to the host seven or eight characters (six plus the media identifier).</p> <p>Extended The scanner reads and reports to the host between five and sixteen characters.</p> <p>Recommended: Extended</p>

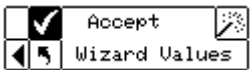
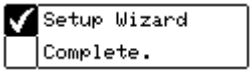
Selection	Description/Result
Step 37 Press ►, then  , to accept the changes and move to the next option.	

Configuring the RMU:

Selection	Description/Result
<p>Note: The IP Address, Subnet Mask, and Gateway options are present only if a RMU is installed. These items set up the network configuration of the RMU.</p> 	The current field is highlighted. Make sure that you enter a valid number for each field.
Step 38 Set the IP Address by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields. If an RMU is not installed, skip to step 44.	
Step 39 After the last digit is entered, press ► to select the right arrow icon, then press ►, then press  to accept the changes and move to the next option.	
	The current field is highlighted. Make sure that you enter a valid number for each field.
Step 40 Set the Subnet mask by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields.	
Step 41 After the last digit is entered, press ► to select the right arrow icon, then press ►, then press  to accept the changes and move to the next option.	
	The current field is highlighted. Make sure that you enter a valid number for each field.
Step 42 Set the gateway by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields.	



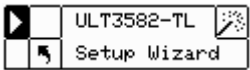
Selection	Description/Result
 <p>Step 43 From the last field of the gateway address, press ► to select the right arrow icon, then press ⏺ to accept the changes.</p>	

Exiting the Setup Wizard:

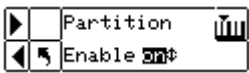

Selection	Description/Result
 <p>Step 44 You have now completed the Setup Wizard. Press ⏺ to accept all values.</p>	Highlight ⏴ to exit the Setup Wizard and cancel changes.
 <p>Step 45 Press ⏺ to exit the wizard.</p>	The display will return to the main menu, and the library will be returned to online.

Configuring a Non-partitioned Library


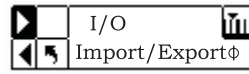

Starting the Wizard:

Selection	Description/Result
 <p>Step 1 From the Setup menu, highlight . then press ⏺.</p>	Runs the Setup Wizard.
 <p>Step 2 Press ⏺ to begin using the wizard.</p>	

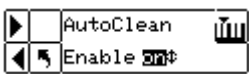
Enabling/Disabling Partitions:


Selection	Description/Result
 <p>Step 3 Press ▲ or ▼ and select off to disable partitioning. Next, press ► to highlight the right arrow, then press  to continue to Step 4.</p>	<p>off Host sees entire library.</p>

Configuring the I/O Slot:

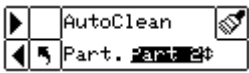

Selection	Description/Result
<p>Attention: If you have earlier selected to set partitioning to "on", steps 16 and 17 will not be available.</p>  <p>Step 4 Press ▲ or ▼ to select the configuration of the I/O slot.</p>	<p>Available options are:</p> <p>Import/Export (Recommended) If you have one partition, the host will see 1 input/output slot and 23 data slots.</p> <p>Storage This slot appears as a valid storage location to the host application. (The host will see 24 data slots if you only have one partition.) If partitioning is enabled, this slot cannot be set to storage. Note: This option is not available if partitioning is enabled.</p>
 <p>Step 5 Press ►, then , to accept the changes and move to the next option.</p>	

Enabling/Disabling AutoClean:

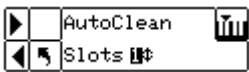

Selection	Description/Result
 <p>Step 6 Press ▲ or ▼ to enable or disable AutoClean. If you do not enable AutoClean, skip to Step 10.</p>	<p>Available options are:</p> <p>on The library automatically cleans the drives when cleaning is required. Overall slots available for data cartridges are reduced. Host software cleaning features must be turned off.</p> <p>If you select on, the Setup Wizard will proceed to Step 6.</p> <p>off AutoClean is disabled.</p> <p>If you select off, the Setup Wizard will skip to Step 10.</p>

Selection	Description/Result
Step 7 Press ►, then  , to accept the changes and move to the next option.	



Selecting the Mode for AutoClean:

Selection	Description/Result
 Step 8 Press ▲ or ▼ to select the mode for AutoClean.	Available options are: Both Cleans both partitions. Part 1 Only cleans Partition 1. Part 2 Only cleans Partition 2.
Step 9 Press ►, then  , to accept the changes and move to the next option.	

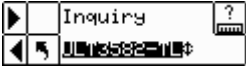

Selecting the Number of Cleaning Slots:

Selection	Description/Result
 Step 10 Press ▲ or ▼ to select the number of cleaning slots you want to configure.	You can allocate up to four slots to be used for cleaning. Slots 20 - 23 can be used as cleaning slots. For more information, see "Configure Cleaning Slots" on page 101. Available sections: 1, 2, 3, 4
Step 11 Press ►, then  , to accept the changes and move to the next option. If you did not enable partitioning, skip to Step 16.	

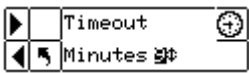

Selecting the Mode for Partition 1:

Selection	Description/Result
 <p>Step 12 Press ▲ or ▼ to select the mode for Partition 1.</p>	<p>Available options are:</p> <p>Random Allows your backup software to access any tape cartridge randomly and access the library on a different logical unit than the drives.</p> <p>Sequential Requires the backup software to write the data to each of the tape cartridges sequentially, starting with the first one. This mode is used if your host only recognizes tape drives and not libraries.</p>
<p>Step 13 Press ►, then , to accept the changes and move to the next option.</p>	



Setting the Inquiry String:

Selection	Description/Result
 <p>Step 14 Press ▲ or ▼ to set the Inquiry string.</p>	<p>Sets the inquiry string returned to the host in a SCSI inquiry command.</p> <p>Available options are:</p> <ul style="list-style-type: none"> • ULT3582-TL (Recommended) • ULT3583-TL • Scalar 24 • Scalar 100 <p>The other options are available to those users whose host may be having trouble recognizing the library when using the recommended inquiry string. When using an inquiry string other than the one recommended, many menu options will not be available. Only the recommended inquiry string for this library is supported by IBM</p>
<p>Step 15 Press ►, then , to accept the changes and move to the next option.</p>	



Setting the Menu Timeout Value:

Selection	Description/Result
 <p>Step 16 Press ▲ or ▼ to set the number of minutes for the timeout value.</p>	<p>Sets the duration of inactivity on a submenu, which will cause the menu to go back to the Main screen and online state.</p> <p>The timeout window is represented in minutes. You must specify a value between 1 and 9.</p> <p>The default setting is 9 minutes.</p> <p>If you have a password set, after the timeout window has expired, the password will need to be reentered to access the secure menu features.</p>
<p>Step 17 Press ►, then , to accept the changes and move to the next option.</p>	

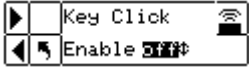

Enabling/Disabling OCP Password Protection:

Selection	Description/Result
 <p>Step 18 Press ▲ or ▼ to enable or disable a password.</p>	<p>Available options are:</p> <p>on The password is required to enter any menu except Status.</p> <p>off Password is disabled.</p> <p>Note: If the password is enabled through the SCSI host, you cannot modify or disable the password using the LCD.</p>
<p>Step 19 Press ►, then , to accept the changes and move to the next option.</p>	<p>If you select on, the Setup Wizard will proceed to Step 20.</p> <p>If you select off, the Setup Wizard will proceed to Step 22.</p>

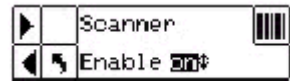

Entering the Password:

Selection	Description/Result
 <p>Step 20 If you enabled a password, set the password by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields. If you did not enable a password, skip to Step 34.</p>	The current field is highlighted. You must select a numeric value between 0 and 9 for all four fields.
<p>Step 21 Press ►, then , to accept the changes and move to the next option.</p>	


Enabling/Disabling Key Clicks:

Selection	Description/Result
 <p>Step 22 Press ▲ or ▼ to enable or disable key clicks.</p>	<p>Available options are:</p> <p>on An audible tone is heard when buttons are pressed on the keypad.</p> <p>off Key clicks are disabled.</p> <p>Recommended: off</p>
<p>Step 23 Press ►, then , to accept the changes and move to the next option.</p>	

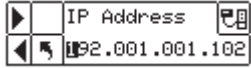
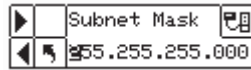
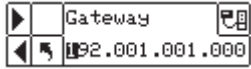
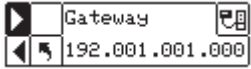
Enabling/Disabling the Bar Code Scanner:

Selection	Description/Result
 <p>Step 24 Press ▲ or ▼ to enable or disable the bar code scanner. If you disable the scanner, skip to Step 40.</p>	<p>Available options are:</p> <p>on All media is scanned for bar codes. Unlabeled or unreadable labeled media generates a user message.</p> <p>off Bar code scanner is disabled.</p> <p>Recommended: on</p>
<p>Step 25 Press ►, then , to accept the changes and move to the next option.</p>	<p>If you select on, the Setup Wizard will proceed to Step 26.</p> <p>If you select off, the Setup Wizard will proceed to Step 28.</p>






Selecting the Bar Code Scanner Mode:

Selection	Description/Result
<div>  </div> <p>Step 26 Press ▲ or ▼ to select the bar code scanner mode.</p>	<p>Available options are:</p> <p>Default The scanner expects to read and reports to the host six characters. Optional one-or two-character media identifiers can be present but are not reported.</p> <p>Media ID The scanner expects to read and reports to the host seven or eight characters (six plus the media identifier).</p> <p>Extended The scanner reads and reports to the host between five and sixteen characters.</p> <p>Recommended: Extended</p>
<p>Step 27 Press ►, then ⏵, to accept the changes and move to the next option.</p>	

Configuring the RMU:

Selection	Description/Result
<p>Note: The IP Address, Subnet Mask, and Gateway options are present only if a RMU is installed. These items set up the network configuration of the RMU.</p>  <p>Step 28 Set the IP Address by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields. If an RMU is not installed, skip to step 44.</p>	The current field is highlighted. Make sure that you enter a valid number for each field.
<p>Step 29 After the last digit is entered, press ► to select the right arrow icon, then press ►, then press ⏵ to accept the changes and move to the next option.</p>	
 <p>Step 30 Set the Subnet mask by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields.</p>	The current field is highlighted. Make sure that you enter a valid number for each field.
<p>Step 31 After the last digit is entered, press ► to select the right arrow icon, then press ►, then press ⏵ to accept the changes and move to the next option.</p>	
 <p>Step 32 Set the gateway by pressing ▲ or ▼ to change the value of the current field and ► or ◀ to move between fields.</p>	The current field is highlighted. Make sure that you enter a valid number for each field.
 <p>Step 33 From the last field of the gateway address, press ► to select the right arrow icon, then press ⏵ to accept the changes.</p>	

Exiting the Setup Wizard:

Selection	Description/Result
<div><div><input checked="" type="checkbox"/> Accept </div><div><input type="checkbox"/> Wizard Values </div></div> <p>Step 34 You have now completed the Setup Wizard. Press  to accept all values.</p>	Highlight  to exit the Setup Wizard and cancel changes.
<div><div><input checked="" type="checkbox"/> Setup Wizard</div><div><input type="checkbox"/> Complete.</div></div> <p>Step 35 Press  to exit the wizard.</p>	The display will return to the main menu, and the library will be returned to online.

Part 2. Operator Guide

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Enter Control Path Failover License Key	123
Command Menu	124
Import Media	124
Import Data Cartridge for Unpartitioned Library	125
Import Data Cartridge for Partitioned Library	126
Import Cleaning Cartridge	127
Export Media	128
Export Data Cartridge	128
Export Cleaning Cartridge	129
Dismount Drive	131
Move Media.	132
Bulk Load	134
Unpartitioned Library Bulk Load.	134
Partitioned Library Bulk Load.	134
Bulk Unload.	136
Unpartitioned Library Bulk Unload	136
Partitioned Library Bulk Unload	136
Sequential Mode	138
Start Loop	138
Start Single	139
Stop Sequential Backup	139
Resume Sequential Backup	140
Status Menu.	141
Display Firmware Version	141
Display Inventory Information	142
Display Motion Counts	144
Display Retry Counts.	145
Display Sensor Status	146
Display Errors	147
Display Serial Number	148
Display World Wide Name.	149
Display Fibre Status	150
Tools Menu	151
Clean Drive	151
Load Firmware.	152
Demo Test	153
Verify Library Test.	154
Drive Maintenance Test	155
Manufacturing Test	158
Position Picker	160
Output Logs.	161
Drive Power On/Off	162
Chapter 7. Ultrium Media	163
Data Cartridge	164
Capacity Scaling	165
WORM (Write Once, Read Many)	165
WORM Media	165
Data Security on WORM Media	165
WORM Media Errors.	166
Requirements	166
Cleaning Cartridge	166
Bar Code Label.	167
Guidelines for Using Bar Code Labels	168
Write-Protect Switch	169
Handling the Cartridges.	169
Provide Training	170
Ensure Proper Packaging	170
Provide Proper Acclimation and Environmental Conditions	171
Perform a Thorough Inspection	171
Handle the Cartridge Carefully	172
Examples of Cartridge Problems	173
Repositioning or Reattaching a Leader Pin	174
Repositioning a Leader Pin.	174
Reattaching a Leader Pin	176
Environmental and Shipping Specifications for Tape Cartridges	180
Disposing of Tape Cartridges	181
Ordering Media Supplies	181
Ordering Bar Code Labels	183

Chapter 6. Using the Menus

The Operator Panel provides a menu-driven operator interface to the library. The menus enable you to view and set the operating parameters of the library.

Summary of Menu Items

This section provides a summary of library operations, such as updating firmware, cleaning drives, and diagnostic operations. Use the following table to quickly locate operating procedures. The procedures listed below are available from the library's Operator Panel. Because 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, which allows you to download library, drive and RMU firmware, and to upload library log information.

If You Want To Do This...	Go To Page...
Bulk Load of cartridges	134
Bulk Unload of cartridges	136
Cancel the Setup Wizard	75
Clean Drive	151
Configure AutoClean	118
Configure Bar Code Scanner	120
Configure Cleaning Slots	101
Configure I/O Slot	107
Configure Library with the Setup Wizard	76
Configure Modes (Random and Sequential)	103
Configure Partitions	105
Configure RMU	116
Demo Test	153
Display Errors	147
Display Firmware Version	141
Display Inventory Information	142
Display Motion Counts	144
Display Retry Counts	145
Display Sensor Status	146
Display Serial Number	148
Display World Wide Name	149
Drive Maintenance Test	155
Enter Control Path Failover License Key	123
Export Media	128
Fibre Setup	111
Import Media	124
Load Firmware	152

If You Want To Do This...	Go To Page...
Manufacturing Test	158
Move Media	132
Output Logs	161
Position Picker	160
Power Drive On/Off to Remove or Replace	162
Reset library to default settings	122
Self Test	154
Set Control Path Failover / Add Control Paths	110
Set Key Clicks on/off for keypad	115
Set Inquiry String	109
Set Password for library access	114
Set SCSI IDs	108
Set Timeout for menus	113
Start, stop, and resume Sequential backup	138
Unload drives and return cartridges to home slots	131

Each menu is accessible through the Operator Panel keypad. Refer to “Operator Panel” on page 19 for an illustration and definition of the keypad. An illustration of the menu tree map is provided in Figure 52 on page 97.

Menu Tree

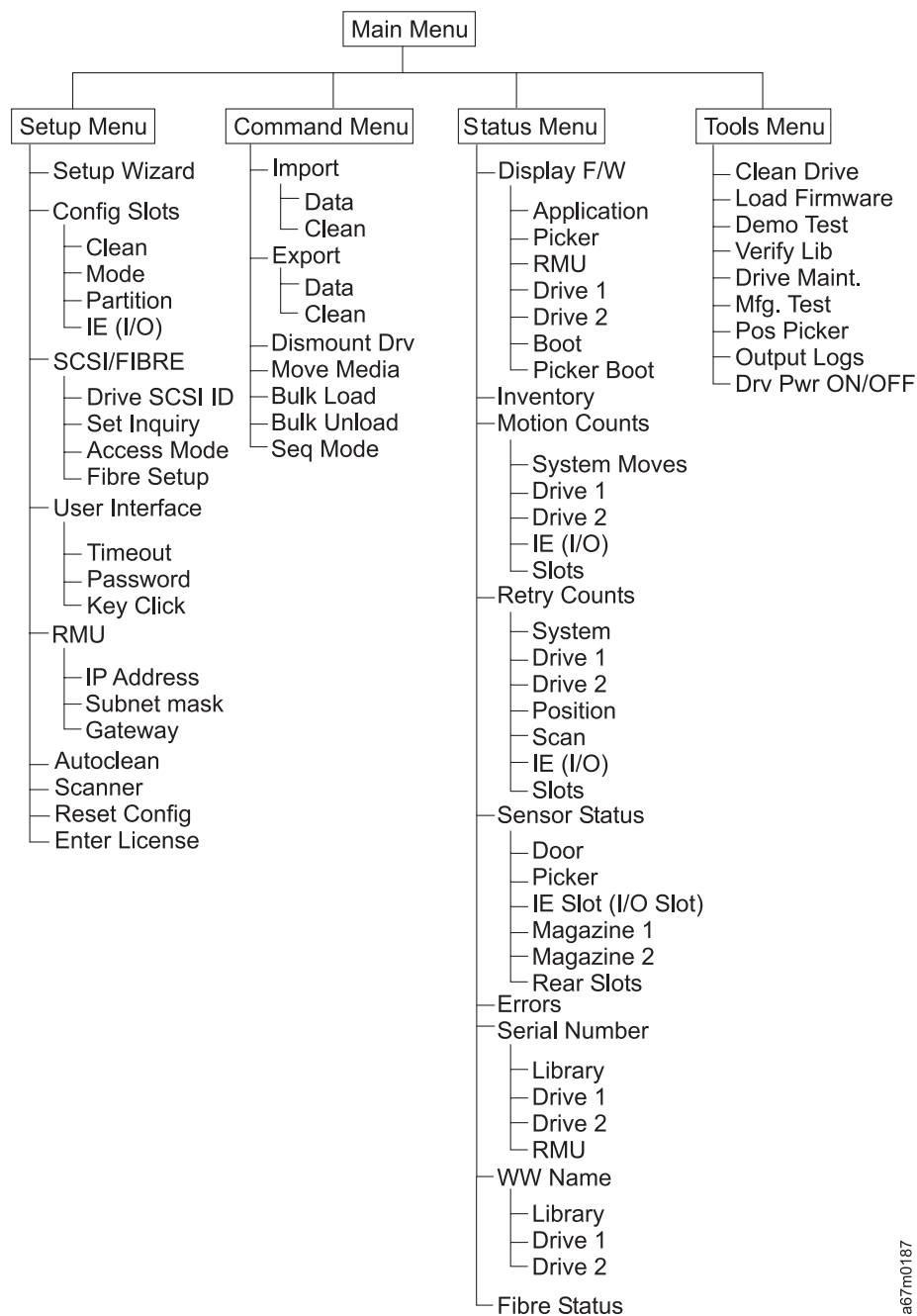


Figure 52. Menu tree structure

Note: Partition will appear in the Configure Slots menu only if you have partitioned the library. For more information, see “Configure Modes” on page 103.

Online and Offline Modes

Your library can operate in an online or offline mode. Typically, the library is in the online mode.

Go Offline?

When you access the **Command**, **Setup**, or **Tools** menus from the Operator Panel, a message notifies you that the library will go to offline mode and you must verify that you want the library to operate in offline mode before proceeding. If you press the Action key (⏏), the library automatically goes into the offline mode. When the library is offline, the SCSI host has limited access to the library. The host can retrieve information from the library but cannot execute any new commands that change the state of the library, such as writing data or moving media. Commands in progress are completed before the library goes offline. Entering the Main Menu automatically returns the library to the online mode. All status information is available in offline mode.

The following screen prompts you to confirm that you are ready to go offline:

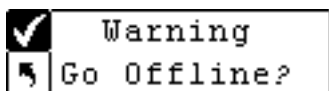



Figure 53. Go Offline?

Pressing ⏏ confirms that you are ready to go offline. If you do not want to go offline, highlight the  by pressing ► or ◀, and then press ⏏. The Operator Panel returns to the Main menu.

Main Menu

The Main menu is the initial screen that enables you to access the **Status** (**1**), **Command** (**2**), **Setup** (**3**), and **Tools** (**4**) menus.

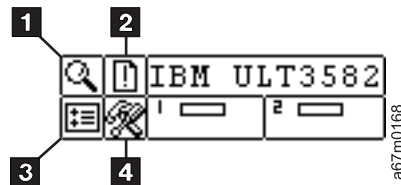






Figure 54. Main Menu

Menu	Description
	<p>The “Status Menu” on page 141 (see 1 in Figure 54) provides selections to:</p> <ul style="list-style-type: none"> • “Display Firmware Version” on page 141 • “Display Inventory Information” on page 142 • “Display Motion Counts” on page 144 • “Display Retry Counts” on page 145 • “Display Sensor Status” on page 146 • “Display Errors” on page 147 • “Display Serial Number” on page 148 • “Display World Wide Name” on page 149 • “Display Fibre Status” on page 150
	<p>The “Command Menu” on page 124 (see 2 in Figure 54) provides selections to:</p> <ul style="list-style-type: none"> • “Import Media” on page 124 • “Export Media” on page 128 • “Dismount Drive” on page 131 • “Move Media” on page 132 • “Bulk Load” on page 134 • “Bulk Unload” on page 136 • “Sequential Mode” on page 138
	<p>The “Setup Menu” on page 101 (see 3 in Figure 54) provides selections for:</p> <ul style="list-style-type: none"> • “Setup Wizard” on page 75 • “Configure Slots” on page 101 • “SCSI and Fibre Channel Loop ID Settings” on page 108 • “User Interface” on page 113 • “Configure RMU” on page 116 • “Configure AutoClean” on page 118 • “Configure Bar Code Scanner” on page 120 • “Reset Configuration” on page 122 • “Enter Control Path Failover License Key” on page 123

Menu	Description
	<p>The “Tools Menu” on page 151 (see 4 in Figure 54 on page 99) provides selections to:</p> <ul style="list-style-type: none"> • “Clean Drive” on page 151 • “Load Firmware” on page 152 • “Demo Test” on page 153 • “Verify Library Test” on page 154 • “Drive Maintenance Test” on page 155 • “Manufacturing Test” on page 158 • “Position Picker” on page 160 • “Output Logs” on page 161 • “Drive Power On/Off” on page 162

The following sections provide descriptions of each menu and instructions on how to use the options in each menu. This information is presented in the order that you would want to access information and configure options when you first set up your library.

Setup Menu

The **Setup** menu enables you to make library system settings.

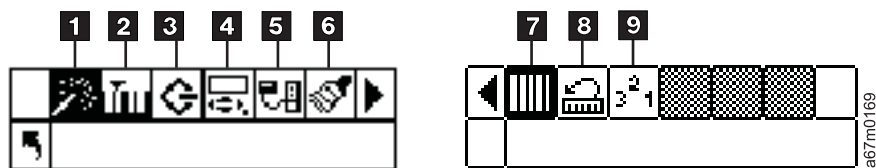


Figure 55. Setup menu

- | | | | |
|----------|------------------------------|----------|--------------------------------|
| 1 | Use the Setup Wizard | 6 | Configure AutoClean |
| 2 | Configure slots | 7 | Configure the bar code scanner |
| 3 | Set SCSI/Fibre IDs | 8 | Reset configuration |
| 4 | Configure the user interface | 9 | Enter license keys |
| 5 | Configure the RMU | | |

Setup Wizard

The Setup Wizard walks you through the process of configuring your library. Using the wizard, you can configure all of the settings that you want from one location in the menu instead of going to each individual item in the menu. For more information, see “Setup Wizard” on page 75.

Configure Slots









Configure Slots enables you to set up specific slots of your library to be allocated for various functions, such as cleaning and partitioning.

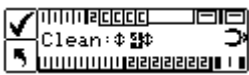
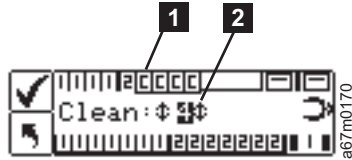
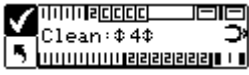

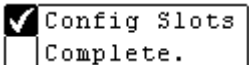



Path: Main Menu —> Setup Menu—> Configure Slots

Configure Cleaning Slots

This option enables you to designate specific rear slots to be used as cleaning slots. If you want to enable autocleaning, you must configure at least one cleaning slot. For more information on autocleaning, see “Configure AutoClean” on page 118.

Selection	Description/Result
 Config Slots	Configures cleaning slots.
Step 1 From the Setup menu, press  until  is highlighted, then press  .	
 Step 2 Press  or  to select Clean .	
Step 3 Press  to move to the next field.	

Selection	Description/Result
 <p>Step 4 Press ▲ or ▼ to select the number of slots that you want to allocate as cleaning slots.</p>	<p>You can allocate up to four slots to be used for cleaning.</p> <p>Slots 20 - 23 can be used as cleaning slots. The slots appear as 1 - 4 on the operator panel display (see 2 in Figure 56). When a slot is configured for cleaning, a C appears in that slot (see 1 in Figure 56).</p>  <p><i>Figure 56. Cleaning Slot</i></p> <p>Note: If partitioning is configured, the number of rear slots may be limited to allow at least one slot in Partition 2.</p>
 <p>Step 5 Press ► to highlight <input checked="" type="checkbox"/>, then press .</p>	
 <p>Step 6 A confirmation screen is displayed. Press  to return to the Main menu.</p>	<p>The cleaning slots are now configured.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Configure Modes

This option enables you to set up your library to run in Random or Sequential mode.

Random





Random mode is used with host software applications that recognize the Medium Changer Logical Unit presented by a tape drive with LUN-1 capability. A tape drive can present both a SCSI Streaming device on Logical Unit Number 0 (LUN-0) and a SCSI Medium Changer device on LUN-1; this allows an application to communicate with and control both devices through a single path to the drive. The capability is independent of the physical transport layer, and allows more than one control path to the library.


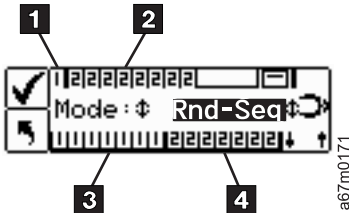


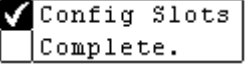

Sequential mode

Sequential mode is used with host software applications that recognize tape drives, but do not recognize a library media changer. In this mode, the library (not the host application software) keeps track of the cartridge locations and manages the insertion and removal of tape media to the drives. When a backup is performed using Sequential mode, data is written to the cartridges in the order in which they are stored in the library.

If you are operating in Sequential mode, your library is not recognized by a host. You must use the **Command** menu to start and stop this mode. If you set your mode to Sequential, you need to configure the sequential mode options. For more information on configuring sequential mode options, see “Sequential Mode” on page 138.

Attention: You may overwrite data if you select this menu item. Ensure you have the proper amount of cartridges for performing the backup.

Selection	Description/Result
 Config Slots Step 1 From the Setup menu, press ► until  is highlighted, then press  .	Configures library operational access modes.
 Step 2 Press ▲ or ▼ to select Mode .	
Step 3 Press ► to move to the next field.	


































Selection	Description/Result
 <p>Step 4 Press ▲ or ▼ to select the mode type.</p>	<p>There are six mode settings:</p> <p>Rnd Sets the library to Random mode.</p> <p>Seq Sets the library to Sequential mode.</p> <p>Rnd-Seq Sets Partition 1 to Random mode and Partition 2 to Sequential mode.</p> <p>Seq-Rnd Sets Partition 1 to Sequential mode and sets Partition 2 to Random mode.</p> <p>Seq-Seq Sets both partitions to Sequential mode.</p> <p>Rnd-Rnd Sets both Partition 1 and Partition 2 to Random mode.</p> <p>If you partitioned the library, the LCD will show you which slots have been designated for Partition 1 and Partition 2 by placing numbers in the slots. See 1, 2, 3, 4 in Figure 57. You can change the partitioning setup using “Configure Partitions” on page 105.</p>  <p><i>Figure 57. Partitioning</i></p>
 <p>Step 5 Press ► to highlight <input checked="" type="checkbox"/>, then press .</p>	<p>The library is configured to the specified modes.</p>
 <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	<p>The display will return to the Main menu, and the library will be online.</p>






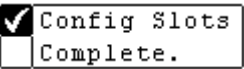

Note: Partitioning will appear in the Configure Slots menu only if you have specified Rnd-Seq, Seq-Seq, Seq-Rnd, or Rnd-Rnd mode. Otherwise, your library will operate as a single library. For more information, see “Configure Modes” on page 103.

Configure Partitions

You can logically partition your single library so that it will appear to a host as if it were two independent physical libraries. Each logical library (partition) can be independently controlled as though it were two different libraries. The partitioning types available for Partitions 1 and 2 respectively are random-sequential, sequential-sequential, random-random, and sequential-random.
















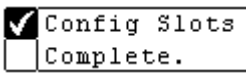

The partition size is configurable. Each partition is assigned one of the front magazines but can have a configurable number of rear slots assigned. The first drive module is assigned to the first partition and the second drive module is assigned to the second partition. If the library is not partitioned, all data slots and drive modules are assigned to a single partition. Follow the procedure below to configure partitions.

Selection	Description/Result
           Config Slots	Configures partitions.
Step 1 From the Setup menu, press  until  is highlighted, then press  .	
           Partition: 8:14     	
Step 2 Press  or  to select Partition.	
Step 3 Press  to move to the next field.	

Selection	Description/Result
 <p>Step 4 Press ▲ or ▼ to select the number of slots you want to designate for Partition 1 and Partition 2.</p>	<p>The slots in the magazine on the left are always Partition 1 and the slots in the magazine on the right are always Partition 2.</p> <p>You can designate a minimum of 8 slots for each Partition (7 magazine slots and 1 rear slot).</p> <p>You can designate a maximum of 15 slots for Partition 1 or 2 (7 magazine slots, 8 rear slots). When the library is in partitioned mode, the I/O slot cannot be configured as a storage slot. If you configure cleaning slots (Figure 58), the total number of slots available for both partitions is reduced. See “Configure Cleaning Slots” on page 101 for more information.</p> <p>As you scroll through the list of slots, the LCD will dynamically show you which slots are designated for Partition 1 and Partition 2 by placing numbers (1 or 2) in the slots. If you configure cleaning slots, they will be displayed with the letter ‘C’ in the Operator Panel (see Figure 58).</p>  <p><i>Figure 58. Mode Settings</i></p>
 <p>Step 5 Press ► to highlight , then press .</p>	<p>The library is configured for the specified partitions.</p>
 <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	<p>The display will return to the Main menu, and the library will be online.</p>

Configure I/O Slot

This option enables you to configure the I/O slot as either a storage slot or an Import/Export slot. If it is configured as a storage slot, it will show up as a valid storage slot to the host application.

Selection	Description/Result
 <p>Step 1 From the Setup menu, press  until  is highlighted, then press .</p>	Configures I/O slot.
 <p>Step 2 Press  or  to select I/O slot.</p>	
<p>Step 3 Press  to move to the next field.</p>	
 <p>Step 4 Press  or  to select configuration option.</p>	<p>Available options are:</p> <p>ST Appears as a valid storage location to the host application. (The host will see 24 data slots if the library is set to one partition.) If partitioning is enabled, this slot cannot be set to storage.</p> <p>I/O The host will see 1 import/export slot and 23 data slots.</p> <p>If the partitions are configured, the I/O slot must be configured as IO.</p>
 <p>Step 5 Press  to highlight , and then press .</p>	The I/O slot is configured.
 <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be online.

SCSI and Fibre Channel Loop ID Settings







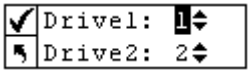
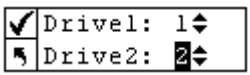
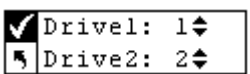



SCSI/FIBRE enables you to set the SCSI and Fibre Channel Loop ID for the library and drives. The IDs identify which ID the library and drives respond to when communicating with the server.



Path: Main Menu → Setup Menu → SCSI/FIBRE























Set Drive SCSI IDs

The SCSI IDs of the drives identify which IDs the drives use to communicate with the host.

Selection	Description/Result
 <p>Step 1 From the Setup menu, press ► until  is highlighted, then press .</p>	Sets SCSI and Fibre Channel Loop IDs.
 <p>Step 2 Press ► until  is highlighted, then press .</p>	Sets the drive SCSI IDs.
 <p>Step 3 Press ▲ or ▼ to select the ID that you want to set for the Drive 1.</p>	<p>You must select a number between 0 and 15. The default ID for Drive 1 is 1.</p> <p>Note: SCSI ID 7 is typically for the host.</p>
<p>Step 4 If you have two drives installed, Press ► to highlight Drive 2.</p>	
 <p>Step 5 Press ▲ or ▼ to select the ID that you want to set for the Drive 2.</p>	<p>You must select a number between 0 and 15. Ensure that this ID is different from the IDs that you set for Drive 1 and the library. The default ID for Drive 2 is 2.</p> <p>Note: SCSI ID 7 is typically for the host.</p>
 <p>Step 6 Press ► to highlight , then press .</p>	The SCSI IDs are set.
<p>Step 7 A confirmation screen is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be online.

Set Inquiry String

Set Inquiry enables the server to detect your library as another existing IBM Tape Library product. This can be useful if the server software does not currently include drivers to communicate with the library.












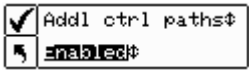


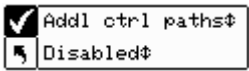



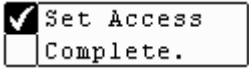

Selection	Description/Result
  SCSI/FIBRE	Sets SCSI and fibre settings.
Step 1 From the Setup menu, press  until  is highlighted, then press  .	
  Set Inquiry	Sets Inquiry string.
Step 2 Press  until  is highlighted, then press  .	
 Emulation  ULT3582-TL	Sets the inquiry string returned to the host in a SCSI inquiry command. Available options are: <ul style="list-style-type: none"> • ULT3582-TL (Recommended) • ULT3583-TL • Scalar 24 • Scalar 100 The other options are available to those users whose host may be having trouble recognizing the library when using the recommended inquiry string. When using an inquiry string other than the one recommended, many menu options will not be available. Only the recommended inquiry string for this library is supported by IBM
Step 3 Press  or  to select the inquiry string for your library.	
 Emulation  ULT3582-TL	The inquiry string is set.
Step 4 Press  to highlight  , then press  .	
 Set Inquiry  Complete.	The display will return to the Main menu, and the library will be online.
Step 5 A confirmation screen is displayed. Press  to dismiss.	

Set Control Path Failover / Add Control Paths (Access Mode)

Access Mode enables you to set control path failover and additional control paths.



















The Control Path Failover feature enables the server to switch the control of the library from one drive to the other in the event of a communication failure. For additional details, see “Using Multiple Control Paths” on page 34.



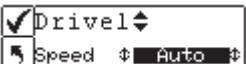
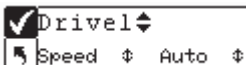



Adding Control Paths will allow the library to remain operational in the event of a failure in the other control path. See “Using Multiple Control Paths” on page 34.

Selection	Description/Result
 <p>Step 1 From the Setup menu, press  until  is highlighted, then press .</p>	Sets SCSI IDs.
 <p>Step 2 Press  until  is highlighted, then press .</p>	Sets access mode.
 <p>Step 3 Press  or  to select the control path.</p>	Available options are: <ul style="list-style-type: none"> Disabled Enabled
 <p>Step 4 Press  or  to enable or disable the selected control path.</p>	Enables or disables the selected Control Path mode. <p>Available options are:</p> <ul style="list-style-type: none"> Enabled Disabled
 <p>Step 5 Press  to highlight , then press .</p>	The access mode is set.
 <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be online.

Fibre Setup

Fibre Setup allows you to set the Loop ID, speed, and topology of each Fibre Channel drive installed in your library.

Selection	Description/Result
 <p>Step 1 From the Setup menu, press  until  is highlighted, then press .</p>	Selects the SCSI/FIBRE submenu item.
 <p>Step 2 Press  to highlight  then press .</p>	
 <p>Step 3 Press  or  to select a drive.</p>	You must select a number between 0 and 127. The default ID for Drive 1 is 17. The default ID for Drive 2 is 18.
<p>Step 4 Press  to move to the next field.</p>	
<p>Step 5 Press  or  to select the fibre setting that you wish you change.</p>	<p>The following selections are available:</p> <p>Loop ID</p>  <p>Select to set the drive fibre ID.</p> <p>Topol</p>  <p>Select to set the topology of the fibre drive.</p> <p>Speed</p>  <p>Select to set the speed of the fibre drive.</p>
<p>Step 6 Press  to move to the next field.</p>	

Selection	Description/Result
<p>Step 7 Press ▲ or ▼ to select the desired value.</p>	<p>The selection of values are:</p> <p>Loop ID values</p>  <p>Select a number between 0 and 127. Ensure that this ID is different from the IDs you set for Drive 1 and the library. The default is 18.</p> <p>Topol values</p>  <p>Auto L Auto N (default) Fabric Loop</p> <p>Speed values</p>  <p>Auto (default) 2 Gb/s 1 Gb/s</p>
<p>Step 8 Press ◀ to move to the previous field. Repeat Steps 5 through 7 until all desired changes are made to the fibre settings.</p>	
 <p>Step 9 Press ▶ to highlight <input checked="" type="checkbox"/>, then press  to save changes.</p>	
 <p>Step 10 Press  to return to the Main menu.</p>	<p>The display will return to the Main menu, and the library will be online.</p>

User Interface

User Interface enables you to configure the LCD timeout, password, and key click settings.







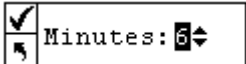
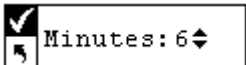


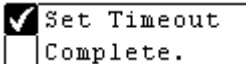



Path: Main Menu → Setup Menu → User Interface

Set Timeout

Timeout selects how long the library is available for operator menu selections before it automatically returns to the Main menu due to screen inactivity. This feature is designed to provide you with security for your system.








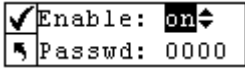



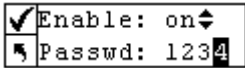




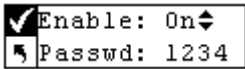



Note: When the timeout period ends, the library returns to an online status, and it is again accessible by a SCSI host.

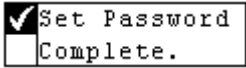

Selection	Description/Result
 <p>Step 1 From the Setup menu, press ► until  is highlighted, then press .</p>	.
 <p>Step 2 Press ► until  is highlighted, then press .</p>	Sets timeout window.
 <p>Step 3 Press ▲ or ▼ to select the value of the timeout window.</p>	<p>The timeout window is represented in minutes. You must specify a value between 1 and 9.</p> <p>The default setting is 9 minutes.</p> <p>If you have a password set, after the timeout window has expired, you need to reenter the password to access the library.</p>
 <p>Step 4 Press ► until  is highlighted, then press .</p>	
 <p>Step 5 A confirmation screen is displayed. Press  to dismiss.</p>	<p>The timeout value is set.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Set Password

Password enables you to enable or disable a password for access to the library. This enables you to prevent unauthorized personnel from disrupting the operation of the library. If a password is set, it is required to view or execute any of the options in the **Setup**, **Command**, or **Tools** menus. If you have set a timeout value, after the specified number of minutes of inactivity, you will automatically be logged out and you will have to reenter your password. By default, there is no password set on your library.









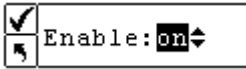


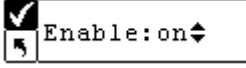



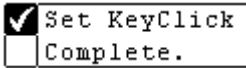

Note: If the password is enabled through the SCSI host, you cannot modify or disable the password using the LCD on the library.

Selection	Description/Result
 <p>Step 1 From the Setup menu, press  until  is highlighted, then press .</p>	
 <p>Step 2 Highlight  and press .</p>	Sets password.
 <p>Step 3 Press  or  to enable or disable the password function.</p>	<p>Available options are:</p> <p>on Password is required to access secure menu features Note: If the password option is enabled, you <u>must</u> enter a password before exiting this menu item.</p> <p>off Password disabled.</p> <p>Note: If the password is enabled through the SCSI host, you cannot modify or disable the password using the LCD.</p>
<p>Step 4 Select  to move to the Password field.</p>	
 <p>Step 5 Set a password by pressing  or  to change the value of the current field, and  or  to move between fields.</p>	The current field is highlighted. You must select a numeric value between 0 and 9 for all four fields.
 <p>Step 6 From the last field of the password, press  until  is highlighted, then press .</p>	The password is set.

Selection	Description/Result
Step 7 Record the password on the Appendix G, "3582 Configuration Form," on page 307 and store the form in a secure location for future reference.	
 Step 8 A confirmation screen is displayed. Press  to dismiss.	After you have set a password, you can turn it on and off by following steps 1 - 3 above. You can change the password by following steps 1 - 7. The display will return to the Main menu, and the library will be online.

Set Key Clicks

Key Click enables you to enable or disable an audible tone when the keys on the keypad are pressed.

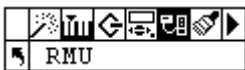



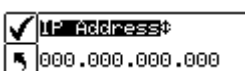

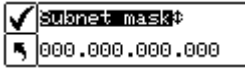
Selection	Description/Result
 Step 1 From the Setup menu, press  until  is highlighted, then press  .	
 Step 2 Press  until  is highlighted, then press  .	Sets key clicks.
 Step 3 Press  or  to enable or disable the key click function.	Available options are: on Turns on audible key click tone. off Turns off key click tone. (Recommended)
 Step 4 Press  to highlight  , then press  .	Key clicks are set.
 Step 5 A confirmation screen is displayed. Press  to dismiss.	The display will return to the Main menu, and the library will be online.


Configure RMU

The optional Remote Management Unit (RMU) provides remote host operation through a Web browser. After you have installed the RMU, you configure it using this menu option. For more information on installing or replacing the RMU, see “Replacing an RMU” on page 217.



Path: Main Menu → Setup Menu → RMU

Selection	Description/Result
 RMU	<p>Configures the RMU.</p> <p>An error appears if an RMU is not installed or is not functioning properly.</p>
<p>Step 1 From the Setup menu, press ► until  is highlighted, then press .</p>	
 IP Address 000.000.000.000	<p>The current field is highlighted. Make sure that you enter a valid number for each field.</p>
<p>Step 2 Select the IP Address by pressing ▲ or ▼. Use ◀ or ▶ to highlight the IP Address value field. To change the value of the current field press ▲ or ▼. Use ◀ or ▶ to move between fields.</p>	
 IP Address 000.000.000.000	
<p>Step 3 From the last field of the IP Address, press ► until IP Address is highlighted again.</p>	
 Subnet Mask 000.000.000.000	<p>The current field is highlighted. Make sure that you enter a valid number for each field.</p>
<p>Step 4 Select the Subnet Mask by pressing ▲ or ▼. Use ◀ or ▶ to highlight the IP Address value field. To change the value of the current field press ▲ or ▼. Use ◀ or ▶ to move between fields.</p>	
 Subnet Mask 000.000.000.000	
<p>Step 5 From the last field of the Subnet Mask, press ► until Subnet Mask is highlighted again.</p>	

<div> <input checked="" type="checkbox"/> Gateway\$ <input type="checkbox"/> 000.000.000.000 </div> <p>Step 6 Select the Gateway by pressing ▲ or ▼. Use ◀ or ▶ to highlight the IP Address value field. To change the value of the current field press ▲ or ▼. Use ◀ or ▶ to move between fields.</p>	<p>The current field is highlighted. Make sure that you enter a valid number for each field.</p>
<div> <input checked="" type="checkbox"/> Gateway\$ <input type="checkbox"/> 000.000.000.000 </div> <p>Step 7 From the last field of the Gateway address, press ▶ to set the Gateway mask and highlight <input checked="" type="checkbox"/>.</p>	
<div> <input checked="" type="checkbox"/> Set NET CFG <input type="checkbox"/> Complete. </div> <p>Step 8 A confirmation screen is displayed. Press  to accept the RMU settings.</p>	<p>Your RMU is configured and ready for use.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Configure AutoClean




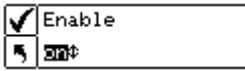
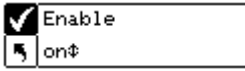


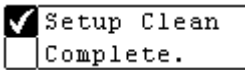

AutoClean is managed through the library and operates independently of the host application. AutoClean detects when a drive needs to be cleaned and automatically cleans it without requiring user intervention. To use the AutoClean feature, you must have at least one slot configured as a cleaning slot. For more information on configuring cleaning slots, see “Configure Cleaning Slots” on page 101. The library tracks the usage of the cleaning cartridge, posts an alert message on the LCD when the cleaning cartridge has expired, and requires you to export the cartridge.

There are two methods for autocleaning: with a partitioned library and with an unpartitioned library.





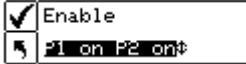


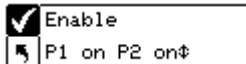



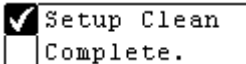



Path: Main Menu → Setup Menu → AutoClean

AutoClean Unpartitioned Library:

Selection	Description/Result
 <p>Step 1 From the Setup menu, press ► until  is highlighted, then press .</p>	Configures automatic cleaning of drives.
 <p>Step 2 Press ▲ or ▼ to enable or disable the AutoClean function.</p>	<p>Available options are:</p> <p>on The library automatically cleans the drives when cleaning is required. Overall slots available for data cartridges is reduced. Host software cleaning features MUST be turned off.</p> <p>off AutoClean function is disabled.</p>
 <p>Step 3 Press ► to highlight , then press .</p>	AutoClean is configured.
 <p>Step 4 A confirmation screen is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be online.

AutoClean Partitioned Library:




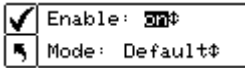
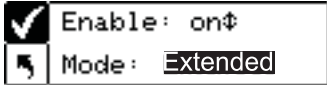
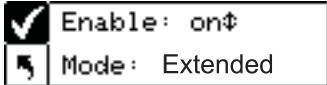


Selection	Description/Result
 <p>Step 1 From the Setup menu, press  until  is highlighted, then press .</p>	Configures automatic cleaning of drives.
 <p>Step 2 Press  or  to select one of the options.</p>	<p>Available options are:</p> <p>P1 on P2 on AutoClean is enabled for both partitions.</p> <p>P1 on P2 off AutoClean is enabled for partition 1 only.</p> <p>P1 off P2 on AutoClean is enabled for partition 2 only.</p> <p>P1 off P2 off AutoClean is disabled for both partitions.</p>
 <p>Step 3 Press  to highlight , then press .</p>	AutoClean is configured.
 <p>Step 4 A confirmation screen is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be online.




Configure Bar Code Scanner

This menu function enables or disables the bar code scanner. The bar code scanner reads and reports the information that it scans and displays this information on the Operator Panel. The library reports the bar code information to the host according to the mode it is configured for and displays alert messages on the Operator Panel if the scanned bar code does not match the bar code length and media identifier requirements of the mode.



Path: Main Menu → Setup Menu → Scanner

Selection	Description/Result
 <p>Step 1 From the Setup menu, press ► to highlight , then press .</p>	Configures the bar code scanner.
 <p>Step 2 Press ▲ or ▼ to enable or disable the bar code scanner.</p>	<p>Available options are:</p> <p>on All media is scanned for bar codes. Unlabeled or unreadable labeled media generates a user message.</p> <p>off Bar code scanner is disabled.</p>
<p>Step 3 Press ► to move to the next field.</p>	
 <p>Step 4 Press ▲ or ▼ to select the scanner mode.</p>	<p>Available options are:</p> <p>Default The scanner expects to read and reports to the host six characters. Optional one- or two-character media identifiers can be present but are not reported.</p> <p>Media ID The scanner expects to read and reports to the host seven or eight characters (six plus the media identifier).</p> <p>Extended (default) The scanner reads and reports to the host between five and sixteen characters.</p>
 <p>Step 5 Press ► to highlight , and then press .</p>	Your bar code scanner is configured and ready for use.

Selection	Description/Result
<div>  Set Scanner  Complete. </div> <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	<p>The display will return to the Main menu, and the library will be online.</p>

Reset Configuration




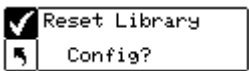

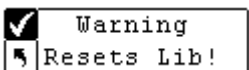

Reset Config enables you to reset your library to the default settings. For more information of the default values, see “Step 9. Configure Your Library” on page 72.

Note

If the Control Path Failover feature is installed, this option will be disabled and must be re-enabled. To re-enable the Additional Control Path option, re-enter the Control Path Failover License Key.



Path: Main Menu —> Setup Menu —> Reset Config










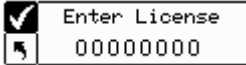



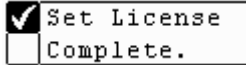

Selection	Description/Result
 Step 1 From the Setup menu, press ► until  is highlighted, then press  .	Resets the library configuration.
 Step 2 A confirmation screen is displayed. Press  to continue.	
 Step 3 A warning screen prompts you to ensure that you want to reset the library configuration. Press  to continue.	<p>The library reboots and is set to the default configuration.</p> <p>The Setup Wizard also starts to enable you to set a new configuration.</p> <p>The display will return to the Main menu, and the library will be online.</p>



Enter Control Path Failover License Key

Enter Control Path Failover License Key enables you to add a feature license key to enable additional features. Please call your IBM representative to purchase a feature license key.

Path: Main Menu —> Setup Menu —> Enter License

Selection	Description/Result
 Step 1 From the Setup menu, press  until  is highlighted, then press  .	Enter feature license key.
 Step 2 Enter the license by pressing  or  to change the value of the current field and  or  to move between fields.	The current field is highlighted. You must select a value from 0 and 9 or A to F for all 8 fields.
 Step 3 Press  to highlight  , then press  .	
 Step 4 A confirmation screen is displayed. Press  to dismiss.	The display will return to the Main menu, and the library will be online.

Command Menu

The **Command** menu provides access to commands that cause motion within the library. From the **Command** menu, you can:

- Import media (see **1** in Figure 59)
- Export media (see **2** in Figure 59)
- Dismount drives (see **3** in Figure 59)
- Move media (see **4** in Figure 59)
- Bulk Load media (see **5** in Figure 59)
- Bulk Unload media (see **6** in Figure 59)
- Set Sequential mode options (see **7** in Figure 59)



Figure 59. Command menu

Import Media

The **Import** option enables you to move a data or cleaning cartridge from the I/O slot to other locations in your library. By using **Import**, you can insert a cartridge into the library without opening the front door. If your I/O slot is configured as a storage slot, remove any present data cartridge before running this command.

There are two import options:

- Import Data Cartridge
- Import Cleaning Cartridge

To import a cleaning cartridge, you must first configure a cleaning slot location. For more information on configuring cleaning slots, see “Configure Cleaning Slots” on page 101. There are two methods for importing a data cartridge: with a partitioned library and with an unpartitioned library.









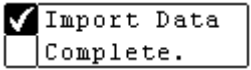

CAUTION:

When a cartridge is inserted into the I/O slot, the picker may grab the cartridge to scan it and then place the cartridge back into the I/O slot or another slot in the library. This process can take up to 11 seconds; during that time, you must not insert another cartridge into the I/O slot.









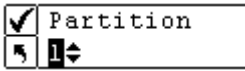





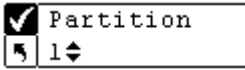

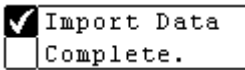


Path: Main Menu —> Command Menu —> Import







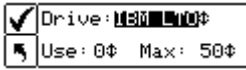
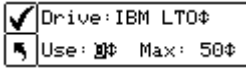
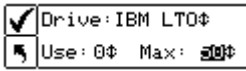
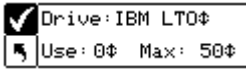


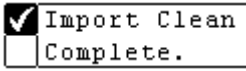

Import Data Cartridge for Unpartitioned Library

Selection	Description/Result
<p>Step 1 Open the I/O door and insert a data cartridge into the I/O slot.</p>	
 <p>Step 2 From the Command menu, press  to highlight , then press .</p>	Imports media from I/O slot.
<p>Step 3</p>  <p>Press  to highlight , then press .</p>	Imports a data cartridge.
 <p>Step 4 A confirmation screen is displayed. Press  to dismiss.</p>	<p>The data cartridge is imported to the first available slot starting with Slot 1.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Import Data Cartridge for Partitioned Library

Selection	Description/Result
<p>Step 1 Open the I/O door and insert a data cartridge into the I/O slot.</p> 	
<p>Step 2 From the Command menu, press  to highlight , then press .</p> 	Imports media from I/O slot.
<p>Step 3 Press  to highlight , then press .</p> 	Imports a data cartridge.
<p>Step 4 Press  or  to select the partition that you want to import the cartridge into.</p>	
<p>Step 5 Press  to highlight , then press .</p> 	The data cartridge is imported to the first available slot in the specified partition.
<p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p> 	The display will return to the Main menu, and the library will be online.

Import Cleaning Cartridge

Selection	Description/Result
Step 1 Open the I/O door and insert a cleaning cartridge into the I/O slot.	
	Imports media from I/O slot.
Step 2 From the Command menu, press ► to highlight  , then press  .	
	Imports a cleaning cartridge. To use this feature, you must have a cleaning slot configured. See “Configure Cleaning Slots” on page 101 for more information.
Step 3 Press ► to highlight  , then press  .	
	
Step 4 Press ▲ or ▼ to select the Drive type.	
Step 5 Press ► to move to the next field.	
	You need to specify how many times this cartridge has been used, if any.
Step 6 Press ▲ or ▼ to select how many times the cleaning cartridge has been used.	
Step 7 Press ► to move to the next field.	
	For LTO media, the maximum number of uses is 50. You can specify a different number, if you want to restrict the number of times this cleaning cartridge is used.
Step 8 Press ▲ or ▼ to set the maximum number of times the cleaning cartridge can be used.	
	The cleaning cartridge is imported to the first available cleaning slot.
Step 9 Press ► to highlight  , then press  .	
	The display will return to the Main menu, and the library will be online.
Step 10 A confirmation screen is displayed. Press  to dismiss.	

Export Media







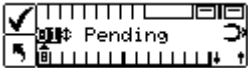
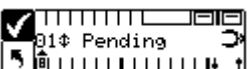




Export enables you to move a data or cleaning tape cartridge from the source slot you select to the I/O slot. This enables you to remove a cartridge from the library without opening the front door. If the I/O slot is configured as a storage slot, you will not be able to export data cartridges. For more information on configuring the I/O slot, see “Configure I/O Slot” on page 107.



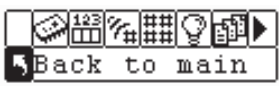


You can use the Move Media command to export data cartridges when the I/O slot is configured as a data slot. For more information, see “Move Media” on page 132.










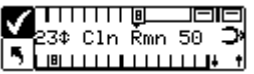


Path: Main Menu → Command Menu → Export

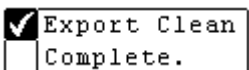

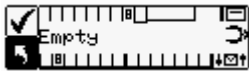



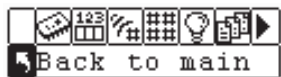



Export Data Cartridge

Selection	Description/Result
Step 1 Open the I/O door and check the I/O slot to make sure that it is empty. If a cartridge is present, remove it.	
	Exports media to I/O slot.
Step 2 From the Command menu, press ► until  is highlighted, then press  .	
	Exports a data cartridge.
Step 3 Highlight  and press  .	
	SRC = source In this example, the tape cartridge in slot 01 is to be exported to the I/O slot.
Step 4 Press ▲ or ▼ to select the slot that you want to export the media from.	
	The specified data cartridge is exported to the I/O slot.
Step 5 Press ► to highlight  , then press  .	
	
Step 6 A confirmation screen is displayed. Press  to dismiss.	

Selection	Description/Result
<p>Step 7 You can continue to export data cartridges, or you can exit to the Command menu. Press ► until  is highlighted, then press  to return to the Command menu.</p>	
 <p>Step 8 Press ► until  is highlighted, then press  to return to the Main menu.</p>	The display will return to the Main menu, and the library will be online.

Export Cleaning Cartridge

Selection	Description/Result
<p>Step 1 Open the I/O door and check the I/O slot to make sure that it is empty. If a cartridge is present, remove it.</p>	
 <p>Step 2 From the command menu, press ► until  is highlighted, then press .</p>	Exports media to I/O slot.
 <p>Step 3 Highlight  and press .</p>	Exports a cleaning cartridge.
 <p>Step 4 Press ▲ or ▼ to select the slot that you want to export the media from.</p>	<p>SRC = source</p> <p>Cln Rmn = number of cleanings remaining on cartridge</p> <p>Cleaning cartridges can be stored in slots 20 - 23.</p> <p>In this example, the tape cartridge in slot 23 is to be exported to the I/O slot.</p>
 <p>Step 5 Press ► until  is highlighted, then press .</p>	The specified cleaning cartridge is exported to the I/O slot.

Selection	Description/Result
 <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	
 <p>Step 7 You can continue to export cleaning cartridges, or you can exit to the Command menu. Press  until  is highlighted, then press  to return to the Command menu.</p>	
 <p>Step 8 Press  until  is highlighted, then press  to return to the Main menu.</p>	<p>The display will return to the Main menu, and the library will be online.</p>







Dismount Drive

Dismount Drive unloads all drives and returns cartridges to their source slots.

Note: When you dismount a drive, both partitions will be affected.



Path: Main Menu —> Command Menu—> Dismount Drv








Selection	Description/Result
<div> Dismount Drv</div> <div>Step 1 From the Command menu, press▶ until  is highlighted, then press .</div>	Moves media within your library.
<div>Step 2 The cartridges are unloaded from the drives and returned to their source slots.</div>	
<div> Dismount Drv  Complete.</div> <div>Step 3 A confirmation screen is displayed. Press  to dismiss.</div>	The display will return to the Main menu, and the library will be online.

Move Media

Move Media enables you to move a tape cartridge from an existing position to a new position. You also use this function to manually insert a cartridge into a drive or remove a cartridge from a drive.



Path: Main Menu → Command Menu → Move media

Selection	Description/Result
 <p>Step 1 From the Command menu, press  until  is highlighted, then press .</p>	Moves media within your library.
 <p>Step 2 Press  or  to select the source slot.</p>	<p>SRC = Source Slot TGT = Target Slot</p> <p>The move media screen provides a visual representation of the storage slots in your library.</p> <ul style="list-style-type: none"> Magazine slots <ul style="list-style-type: none"> Shown on the bottom of the screen Numbered sequentially from left to right 01 to 14 Rear slots <ul style="list-style-type: none"> Shown on the top of the screen Numbered sequentially from left to right 15 to 23 I/O slot <ul style="list-style-type: none"> Shown on the bottom right of the screen ↓↑ Indicate configured as I/O slot (represented by I/O in SRC/TGT fields) <p style="text-align: center;">■ ■</p> <p>Vertical bars indicate configured as data slot (represented by 00 in SRC/TGT fields)</p> <ul style="list-style-type: none"> Drives <ul style="list-style-type: none"> Shown on top right of the screen Indicated by D1 or D2 in the SRC/TGT field

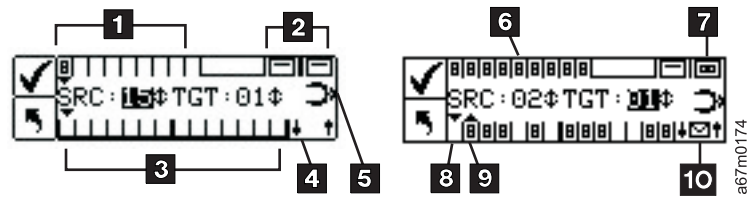
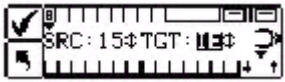
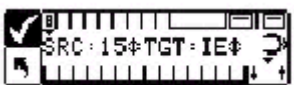
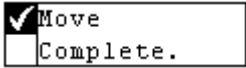
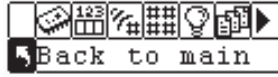


Figure 60. Move media icons. Library with one partition shown.

- | | | | |
|----------|---------------------|-----------|-------------------|
| 1 | Rear slots | 2 | Drives |
| 3 | Magazine slots 1-14 | 4 | I/O slot |
| 5 | Picker | 6 | Cartridge in slot |
| 7 | Cartridge in drive | 8 | Target slot |
| 9 | Source slot | 10 | I/O slot full |

Selection	Description/Result
Step 3 Press ► to move the cursor to the target field.	
 Step 4 Press ▲ or ▼ to select the target slot.	In this example, the cartridge in the source slot 15 is moved to the target slot I/O.
 Step 5 Press ► until ✓ is highlighted, then press ⏵.	The media is moved from the specified source to the specified target location.
 Step 6 A confirmation screen is displayed. Press ⏵ to dismiss.	
Step 7 You can continue to move media, or you can exit to the Command menu. Press ► until ⏴ is highlighted, then press ⏵ to return to the Command menu.	The display will return to the Command menu.
 Step 8 Press ► until ⏴ is highlighted, then press ⏵ to return to the Main menu.	The display will return to the Main menu, and the library will be online.








Bulk Load

Bulk Load enables you to move multiple cartridges from the magazines to the rear slots with one command. For more information on partitioning, see “Configure Partitions” on page 105.










Path: Main Menu —> Command Menu —> Bulk Load

Unpartitioned Library Bulk Load

Selection	Description/Result
  Bulk Load	Moves cartridges from magazines to rear slots.
Step 1 From the Command menu, press ► until  is highlighted, then press  .	
Step 2 The bulk load operation begins. The operation can be cancelled at any time by pressing  .	The library begins loading the rear slots by selecting the left-most-available cartridge in the front left magazine and placing it in the left-most-available rear slot. The Bulk Load continues until either there are no more cartridges in the front magazines or there are no more available slots in the rear.
 Bulk Load Complete.	The display will return to the Main menu, and the library will be online.
Step 3 When the bulk load is complete, a completion screen is displayed. Press  to dismiss the screen.	

Partitioned Library Bulk Load

Selection	Description/Result
  Bulk Load	Moves cartridges from magazines to partitioned rear slots.
Step 1 From the Command menu, press ► until  is highlighted, then press  .	

Selection	Description/Result
<div> <input checked="" type="checkbox"/> Partition <input type="checkbox"/> 1↕ </div> <p>Step 2 Press ▲ or ▼ to select the partition that you want to move cartridges to.</p>	<p>Available options are:</p> <p>Partition 1 Moves cartridges from the left magazine to the available rear Partition 1 slots.</p> <p>Partition 2 Moves cartridges from the right magazine to the available rear Partition 2 slots.</p>
<div> <input checked="" type="checkbox"/> Partition <input type="checkbox"/> 1↕ </div> <p>Step 3 Press ► to highlight <input checked="" type="checkbox"/>, then press .</p>	
<p>Step 4 The bulk load operation begins. The operation can be cancelled at any time by pressing .</p>	<p>Bulk Load for Partition 1 - The library begins loading the rear slots by selecting the left-most-available cartridge in the front left magazine (Magazine 1) and placing it in the left-most-available rear slot for Partition 1. The Bulk Load continues until either there are no more cartridges in the front magazine or there are no more available slots in the rear.</p> <p>Note: Rear slots identified as Partition 1 can only be bulk loaded from Magazine 1, and rear slots identified as Partition 2 can only be bulk loaded from Magazine 2 while partitioning is enabled.</p>
<div> <input checked="" type="checkbox"/> Bulk Load <input type="checkbox"/> Complete. </div> <p>Step 5 When the bulk load is complete, a completion screen is displayed. Press  to dismiss the screen.</p>	<p>The display will return to the Main menu, and the library will be online.</p>




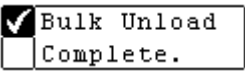

Bulk Unload

Bulk Unload enables you to move all of the cartridges from the rear slots to the front magazines with one command. For more information on partitioning, see “Configure Partitions” on page 105.




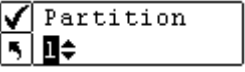






Path: Main Menu → Command Menu → Bulk Unload

Unpartitioned Library Bulk Unload

Selection	Description/Result
 <p>Step 1 From the Command menu, press ► until  is highlighted, then press .</p>	Moves cartridges from rear slots to magazines.
 <p>Step 2 When the bulk unload is complete, a completion screen is displayed. Press  to dismiss the screen.</p>	<p>The library begins unloading the rear slots by selecting the left-most-available cartridge and placing it in the left-most-slot of the left magazine. The bulk unload continues until either there are no more cartridges in the rear slots or there are no more available slots in the magazines.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Partitioned Library Bulk Unload

Selection	Description/Result
 <p>Step 1 From the Command menu, press ► until  is highlighted, then press .</p>	Moves cartridges from rear slots to magazines.
 <p>Step 2 Press ▲ or ▼ to select the partition you want to move cartridges from.</p>	<p>Available options are:</p> <p>Partition 1 Moves cartridges from the rear Partition 1 slots to the left magazine slots.</p> <p>Partition 2 Moves cartridges from the rear Partition 2 slots to the right magazine slots.</p>

Selection	Description/Result
<div> <input checked="" type="checkbox"/> Partition <input type="checkbox"/> 1 </div> <p>Step 3 Press  to highlight <input checked="" type="checkbox"/>, then press .</p>	
<p>Step 4 The bulk unload operation begins. The operation can be cancelled at any time by pressing .</p>	<p>Bulk Unload for Partition 1 - The library begins loading the left magazine by selecting the left-most-available cartridge in the rear slots of Partition 1 and placing it in the left-most slot in the left magazine. The Bulk Unload continues until either there are no more cartridges in the rear slots or there are no more available slots in the magazine.</p> <p>Note: Rear slots identified as Partition 1 can only be bulk unloaded to Magazine 1, and rear slots identified as Partition 2 can only be bulk unloaded to Magazine 2 while partitioning is enabled.</p>
<div> <input checked="" type="checkbox"/> Bulk Unload <input type="checkbox"/> Complete. </div> <p>Step 5 When the bulk unload is complete, a completion screen is displayed. press  to dismiss the screen.</p>	<p>The display will return to the Main menu, and the library will be online.</p>

Sequential Mode

Sequential mode enables you to start, stop, and resume the sequential backup sequence. You can also set sequential loop mode. If your library is partitioned, you can control each partition independently.








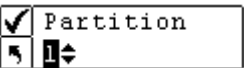


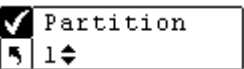





Path: Main Menu → Command Menu → Seq Mode

Start Loop







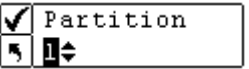
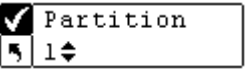


Start Loop enables you to operate in a continuous backup mode. When all tape cartridges have been filled with data, the library begins again with the first cartridge, overwriting tape cartridges upon reuse.

Attention: You may overwrite data if you select this menu item. Ensure you have the proper amount of cartridges for performing the backup.

Selection	Description/Result
 <p>Step 1 From the Command menu, press  until  is highlighted, then press .</p>	Sets the options for sequential backup.
 <p>Step 2 Highlight  and press .</p>	Starts looped sequential backup.
 <p>Step 3 Press  or  to select the partition that you want to set to sequential loop mode.</p>	
 <p>Step 4 press  to highlight , then press .</p>	Sequential loop backup begins. The display will return to the Main menu, and the library will be online.







Start Single

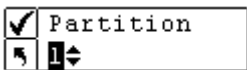
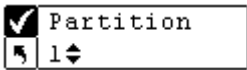


Start Single mode enables you to begin backup with the first cartridge in a specified partition. When all tape cartridges have been filled, the backup operation will stop.

Selection	Description/Result
 <p>Step 1 From the Command menu, press ► until  is highlighted, then press .</p>	Sets the options for single sequential backup.
 <p>Step 2 Press ► until  is highlighted, then press .</p>	Starts single sequential backup.
 <p>Step 3 Press ▲ or ▼ to select the partition that you want to set to sequential single mode.</p>	
 <p>Step 4 Press ► until  is highlighted, then press .</p>	<p>A single sequential backup begins.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Stop Sequential Backup







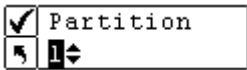
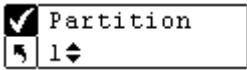


Stop enables you to manually stop the backup process when in sequential mode.

Selection	Description/Result
 <p>Step 1 From the Command menu, press ► until  is highlighted, then press .</p>	Sets the options for sequential backup.
 <p>Step 2 Press ► until  is highlighted, then press .</p>	Stops sequential backup.

Selection	Description/Result
 <p>Step 3 Press ▲ or ▼ to select the partition that you want to stop the sequential backup on.</p>	
 <p>Step 4 Press ► until  is highlighted, then press .</p>	<p>The backup process is stopped.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Resume Sequential Backup

Resume enables you to continue a backup process when in sequential mode. The load operation continues with the next cartridge in the sequence rather than starting over.

Selection	Description/Result
 <p>Step 1 From the Command menu, press ► until  is highlighted, then press .</p>	Sets the options for sequential backup.
 <p>Step 2 Press ► until  is highlighted, then press .</p>	Continues sequential backup.
 <p>Step 3 Press ▲ or ▼ to select the partition on which you want to resume the sequential backup.</p>	
 <p>Step 4 Press ► until  is highlighted, then press .</p>	<p>The backup process is resumed.</p> <p>The display will return to the Main menu, and the library will be online.</p>

Status Menu

The **Status** menu enables you to display operating statistics and system information. From the **Status** menu you can display:

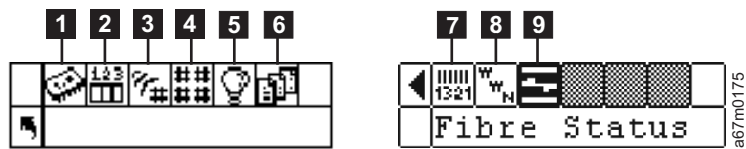


Figure 61. Status Menu

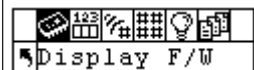






- | | | | |
|----------|---------------------------|----------|-----------------|
| 1 | Firmware Revision Numbers | 6 | Error Logs |
| 2 | Inventory Information | 7 | Serial Number |
| 3 | Motion Counts | 8 | World Wide Name |
| 4 | Retry Counts | 9 | Fibre Status |
| 5 | Sensor Status | | |



Display Firmware Version

Display Firmware displays the current level of firmware that you are running. This information is important for troubleshooting problems. You can also compare the version numbers with the latest level of firmware. You can download the latest level of firmware by visiting <http://www.ibm.com/storage/lto> and clicking on Technical Support or LTO Support.



Path: Main Menu → Status Menu → Display F/W

Selection	Description/Result
 Step 1 From the Status menu, press  until  is highlighted, then press  .	Display F/W displays the current level of library firmware.
 Step 2 Press  or  to view all of the firmware revision numbers.	The current version of library firmware is displayed. You can view firmware revision numbers for: Application Controls the library operations. Picker Operates the cartridge picker mechanism in your library. RMU RMU firmware. Drive1 Drive firmware. Drive2 Drive firmware. Boot Boots the library controller firmware. Picker Boot Boot code for picker.

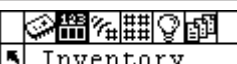


Selection	Description/Result
<div>Application</div> <div>091a.DY036</div> <p>Step 3 To exit, press ► to highlight , then press .</p>	You return to the Status menu.

Display Inventory Information

Inventory displays the tape cartridges present in the rear slots and magazines. A physical inventory is also conducted each time you power on your library.



Path: Main Menu → Status Menu → Inventory

Selection	Description/Result
<div>  <div>Inventory</div> </div> <p>Step 1 From the Status menu, press ► until  is highlighted, then press .</p>	Displays the current library cartridge content.

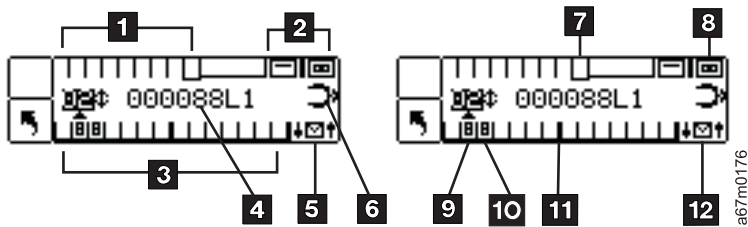


Figure 62. Move media icons

1	Rear slots (15–23)	2	Drives
3	Magazine slots 1–14	4	Bar code scanner results
5	I/O slot	6	Picker
7	Cleaning slot (empty)	8	Cartridge in drive
9	Slot is selected	10	Cartridge in slot
11	Partition divider	12	Cartridge in I/O slot


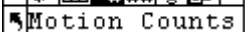



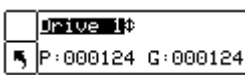


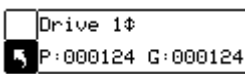



Selection	Description/Result
<div> </div> <p>Step 2 Press ▲ or ▼ to scroll through the various slots. An arrow in front of the slot indicates the slot selected.</p>	<p>The inventory screen provides a visual representation of the storage slots in your library, as shown in Figure 62 on page 142.</p> <ul style="list-style-type: none"> <li>• Magazine slots: <ul style="list-style-type: none"> <li>– Shown on the bottom of the screen <li>– Numbered sequentially from left to right 01 to 14 <li>– The magazines slots will not be shown if the magazines are not installed <li>• Rear slots: <ul style="list-style-type: none"> <li>– Shown on the top of the screen <li>– Numbered sequentially from left to right 15 to 23 <li>– Double bar is shown in rear slots to show partition <li>– A horizontal bar will close off slots reserved for cleaning <li>• I/O slot: <ul style="list-style-type: none"> <li>– Shown on the bottom right of the screen <li>– ↓↑ Indicate configured as I/O slot (represented by I/O in slot field) <li>– ■ ■ Vertical bars indicate configured as data slot (represented by 00 in slot field) <li>• Bar Code Scanner results: <ul style="list-style-type: none"> <li>– Shown on middle of screen and changes as various slots are selected <li>– Blank: scanner: not installed <li>– SCANOFF: scanner: installed but turned off <li>– NOLABEL: no bar code label present or unable to read label <li>– Number: displays entire bar code label regardless of what the scanner is set at <li>– Number of cleaning slots remaining is shown instead of a bar code for full cleaning slots <li>• Drives: <ul style="list-style-type: none"> <li>– Shown on top right of the screen
<div> </div> <p>Step 3 To exit, press ► until ■ is highlighted, then press ●.</p>	<p>You return to the Status menu.</p>

Display Motion Counts

Motion Counts displays how many times a slot or drive has had a cartridge placed in it or removed from it.



Path: Main Menu → Status Menu → Motion Counts




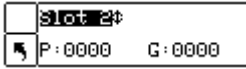
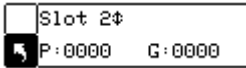


Selection	Description/Result
  Motion Counts Step 1 From the Status menu, press  until  is highlighted, then press  .	Displays slot usage information.
 Step 2 Press  or  to view the motion counts for each slot, drive, and I/O slot.	You can view motion counts for: System Moves Displays the total number of library moves. A move is described as a “get” from one location and a “put” to another location. Drive 1 Displays the number of Gets and Puts to and from Drive 1. Drive 2 Displays the number of Gets and Puts to and from Drive 2. I/O and Slots 1 - 23 Displays the total number of moves for a particular slot. The format of the entries is: P: Number of “puts” to a location. G: Number of “gets” from a location.
 Step 3 To exit, press  until  is highlighted, then press  .	You return to the Status menu.

Display Retry Counts

Retry Counts displays the number of retry operations the picker has attempted to put a cartridge to a specific location or get a cartridge from a particular location.



Path: Main Menu → Status Menu → Retry Counts

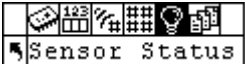



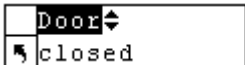
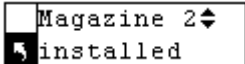


Selection	Description/Result
 <p>Step 1 From the Status menu, press ► until  is highlighted, then press .</p>	Displays the number of retry operations.
 <p>Step 2 Press ▲ or ▼ to view all of the retry counts.</p>	<p>You can get retry counts on the number of:</p> <p>System Displays the total number of library retries.</p> <p>D1 Displays how many times a get or a put retry has occurred for Drive 1.</p> <p>D2 Displays how many times a get or a put retry has occurred for Drive 2.</p> <p>Position Displays how many times the picker has retried positioning.</p> <p>Scan Displays how many times the bar code scanner has scanned the tape cartridges.</p> <p>I/O and Slots 1- 23 Displays how many times a get or a put retry has occurred for a particular slot.</p> <p>The format of the entries is:</p> <p>P: Number of “puts” to a location.</p> <p>G: Number of “gets” from a location.</p>
 <p>Step 3 To exit, press ► until  is highlighted, then press .</p>	You are returned to the Status menu.

Display Sensor Status

Sensor Status displays the results of the real-time sensors on your library.



Path: Main Menu → Status Menu → Sensor Status




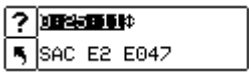
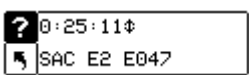


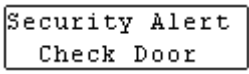

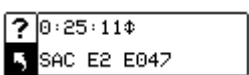


Selection	Description/Result
  Sensor Status Step From the Status menu, press ► until  is highlighted, then press  .	Displays the results of real-time sensors.
 Step 2 Press ▲ or ▼ to view all of the sensor statuses.	You can view sensor status for: Door (Media Access) Opened or closed Picker Empty or full I/O Slot Empty or full Magazine 1 Installed or removed Magazine 2 Installed or removed Rear Slots Represented by a nine character string with "1"s and "-"s (-1-1-1-1-) where 1 means the slot is full, and - means the slot is empty.
 Step 3 To exit, press ► until  is highlighted, then press  .	You are returned to the Status menu.

Display Errors

Errors provides a listing of errors that need to be addressed by the operator. The log can store up to 100 errors and is preserved through power cycles. The log is accessible through the LCD as well as the SCSI interface, the serial port, and the RMU interface. You will be asked to supply log information to IBM Technical Support for troubleshooting purposes if other problem resolution strategies do not work.



Path: Main Menu → Status Menu → Errors




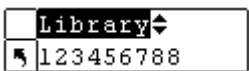
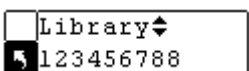


Selection	Description/Result
 <p>Step 1 From the Status menu, press ► until  is highlighted, then press .</p>	Displays Error log.
 <p>Step 2 Press ▲ or ▼ to scroll through the error messages.</p>	<p>The format of the entries is as follows:</p> <p>0:00:00 = <i>hours:minutes:seconds</i> of elapsed time since error occurred.</p> <p>SAC E2 E047 = Service Action Code of error message</p> <p>For more information on error codes, see “Library Error Messages” on page 191.</p>
 <p>Step 3 To obtain more information, press ► to highlight , then press .</p>	The text version of the Error message is displayed.
 <p>Step 4 Press  to dismiss the message and return to the Error log.</p>	
 <p>Step 5 To exit the Error log, press ► to highlight  and then press .</p>	You return to the Status menu.

Display Serial Number

Serial Number displays the serial numbers of the library, drives, and the RMU. You need this information when ordering Feature Code #1680 (see “Using Multiple Control Paths” on page 34).



Path: Main Menu → Status Menu → Serial Number








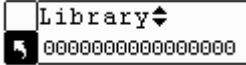



Selection	Description/Result
 <p>Step 1 From the Status menu, press ► until  is highlighted, then press .</p>	Displays serial numbers.
 <p>Step 2 Press ▲ or ▼ to view all of the serial numbers.</p>	Available options are: <ul style="list-style-type: none"> • Library • Drive 1 • Drive 2 • RMU
 <p>Step 3 To exit, press ► until  is highlighted, then press .</p>	You return to the Status menu.

Display World Wide Name

WW Name displays the World Wide Names of the library and drives. You need this information when contacting IBM Technical Support.



Path: Main Menu —> Status Menu —> WW Name

Selection	Description/Result
<div></div> <div><p>Step 1 From the Status menu, press  until  is highlighted, then press .</p></div>	Displays World Wide Names.
<div></div> <div><p>Step 2 Press  or  to view all of the World Wide Names.</p></div>	Available options are: <ul style="list-style-type: none">• Library• Drive 1• Drive 2
<div></div> <div><p>Step 3 To exit, press  until  is highlighted, then press .</p></div>	You return to the Status menu.





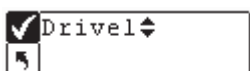




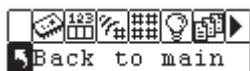


Display Fibre Status

This menu option displays the status of an Ultrium 3 Fibre Channel drive if the fibre channel drive cable is connected to a working light source (FC Adapter card) or the loop back connector is installed on the drive Fibre Channel connector.

If the drive is an Ultrium 2 Fibre Channel drive or an Ultrium 3 Fibre Channel drive with no light source, no status will be displayed.



Path: Main Menu → Status Menu → Fibre Status

Selection	Description/Result
 <p>Step 1 From the Status menu, press ► until  is highlighted, then press .</p>	
 <p>Step 2 Press ▲ or ▼ to select a drive.</p>	
 <p>Step 3 Press ► or ◀ to highlight  then press .</p>	The status of the selected drive will be displayed.
 <p>Step 4 Press  to return to the Fibre Status screen.</p>	
 <p>Step 5 Press ► or ◀ to highlight .</p>	
<p>Step 6 Press  to return to the Main menu.</p>	

Tools Menu

The **Tools** menu provides access to library utilities.



Figure 63. Tools Menu




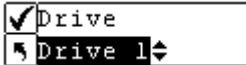
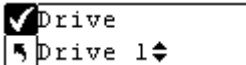



- | | | | |
|----------|--------------------|----------|--------------------|
| 1 | Clean drive | 2 | Load Firmware |
| 3 | Demo test | 4 | Verify Library |
| 5 | Drive maintenance | 6 | Manufacturing test |
| 7 | Position Picker | 8 | Output logs |
| 9 | Drive Power On/Off | | |

Clean Drive

Clean Drive enables you to manually clean your drive components. To use this feature, you must have at least one slot configured as a cleaning slot and it must contain a cleaning cartridge. For more information on configuring cleaning slots, see “Configure Cleaning Slots” on page 101.



Path: Main Menu → Tools Menu → Clean Drive




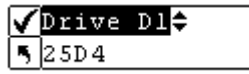
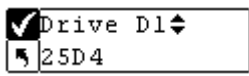



Selection	Description/Result
 Step 1 From the Tools menu, press ► until  is highlighted, then press  .	Manually cleans a drive.
 Step 2 Press ▲ or ▼ to select the drive to be cleaned.	If you have two drives installed, you can clean Drive 1 or Drive 2.
 Step 3 Press ► until  is highlighted, then press  .	The drive is cleaned and the cleaning cartridge is returned to the cleaning slot.
Step 4 A completion screen is displayed. Press  to dismiss.	The display will return to the Main menu, and the library will be returned to online.

Load Firmware

Load Firmware enables you to manually update Drive code using an FMR cartridge. For instructions on creating an FMR cartridge, refer to *Create FMR Tape* in “Drive Maintenance Test” on page 155



Path: Main Menu → Tools Menu → Load Firmware

Selection	Description/Result
Step 1 Open the I/O door and inset the firmware upgrade cartridge into the I/O slot.	
 Step 2 From the Tools menu, press ► until  is highlighted, then press  .	Loads Firmware.
 Step 3 Press ▲ or ▼ to select which firmware you want to upgrade.	Available options are: Drive 1 Upgrades firmware for Drive 1 Drive 2 Upgrades firmware for Drive 2 All Drives Upgrades both drives with a single command
 Step 4 Press ► until  is highlighted, then press  .	The new firmware is loaded and the upgrade cartridge is returned to the I/O slot.
Step 5 A confirmation message is displayed. Press  to dismiss.	
Step 6 Remove the upgrade cartridge from the I/O slot.	The display will return to the Main menu, and the library will be returned to online.

Demo Test




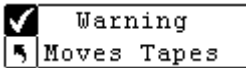

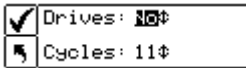
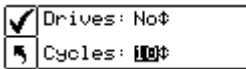
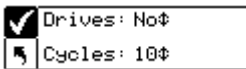


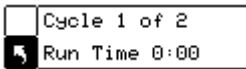

Demo Test randomly moves cartridges within the library to demonstrate robotic motion.


Attention: This test moves cartridges throughout the library. If the library was configured with partitions enabled, you will not be able to run this test.

The minimum number of cartridges required for this test is at least one more cartridge than the total number of drives installed in the library. For example, a library with two drives installed requires at least three cartridges for this test.



Path: Main Menu → Tools Menu → Demo Test




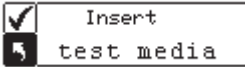



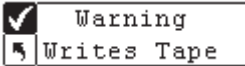


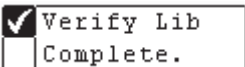

Selection	Description/Result
 <p>Step 1 From the Tools menu, press ► until  is highlighted, then press .</p>	Runs Demo test.
 <p>Step 2 You will be prompted with a warning, press  to continue the test.</p>	Attention: This test will move your cartridges and may change your inventory information by not returning cartridges to the same locations.
 <p>Step 3 Press ▲ or ▼ to select/deselect the Drives.</p>	Available options are: yes Enables loads and unloads to the drives no Does not load or unload cartridges to the drives
<p>Step 4 Press ► to move to the next option.</p>	
 <p>Step 5 Press ▲ or ▼ to select the number of Cycles to include in the demo test.</p>	You can select between 1 and 100 cycles.
 <p>Step 6 Press ► until  is highlighted, then press .</p>	The demo test begins.
 <p>Step 7 A status screen will display the progress of the test. You can press  at any time to cancel the test.</p>	

Selection	Description/Result
Step 8 When the test is complete, a completion message is displayed. Press  to dismiss.	The display will return to the Main menu, and the library will be returned to online.

Verify Library Test



Path: Main Menu → Tools Menu → Verify Lib

Selection	Description/Result
 Step 1 From the Tools menu, highlight  and press  .	
 Step 2 Open the I/O Door and insert a scratch cartridge. Press  to highlight  , then press  .	
 Step 3 Press  to begin diagnostic.	
Step 4 Status screens will display the progress of the test. You can press  at any time to cancel the test.	
 Step 5 Press  to dismiss. Open the I/O Door and remove the cartridge.	<p>If the Verify Library fails, there is probably something obstructing motion of the picker. Open the door and pull out the magazines to verify that all the tapes are pushed into their slots. Look for anything that appears to be blocking the path of the picker. Retry the test. If it still fails, contact IBM Technical Support.</p> <p>The display will return to the Main menu, and the library will be returned to online.</p>

Drive Maintenance Test

Drive Maintenance enables you to perform several different drive diagnostic tests and maintenance functions. To better understand these tests, you need to understand the format of the tape. The tape is divided into four data sections. Each data section contains 96 tracks ($96 \times 4 = 384$, which is the number of tracks on a generation 1 cartridge). On each edge of the tape (2 servo bands), and between the data bands (3 servo bands), there are pre-formatted servo bands (5 in total). A wrap is defined as a trip from logical BOT (Beginning of Tape) to logical EOT (End of Tape). A round trip would be 2 wraps.

Notes:

1. The IO slot must be cleared before you run these tests. Any data on cartridges used for these tests will be erased.
2. Run time records the test time in minutes and seconds (m:ss).

Power on self test (POST)

Runs self diagnostics. This test takes approximately 1 minute.

Write Performance

This test ensures that the drive can read from and write to tape. This test takes approximately six minutes to run.

Normal Read/Write

The drive reads and writes 96 wraps worth of data (all the tracks) in each of the four data sections. This test takes approximately 20 minutes.

Media Read/Write

Since media damage usually comes from the edges of tape to the center of tape, the media test performs a read/write test by writing two wraps on each of the two outside data bands, closest to the edge of tape, on both edges of the tape, for the entire length of tape. This test takes approximately 12 minutes.

Head Read/Write

In this test the drive performs a resistance check on the recording head, then it does a read/write test where it writes two wraps in each of the two center data bands of tape to verify the head is performing well. This test takes approximately 12 minutes.

Wrap Test

In this test the drive performs a check of the SCSI/Fibre circuitry from and to the SCSI/Fibre connector.

Note: For drives with SCSI connectors, the test requires that the drive be terminated by either the terminator on the connector or at the end of the bus. Before you select this function, disconnect the SCSI cable of the library that is closest to the server. Then, attach the SCSI wrap plug to that SCSI connector.

Create FMR

The drive loads firmware onto a data cartridge to create a firmware upgrade (FMR) cartridge. See “Creating or Erasing an FMR Tape for Drive Firmware” on page 234.

Clear FMR

This option erases the firmware from the FMR cartridge so it can be used as a data cartridge. See “Creating or Erasing an FMR Tape for Drive Firmware” on page 234.

Drive Logs

Downloads all drive logs to a host machine for submittal to support personnel. Drive dumps can be output from LTO drives only.

Preserve Dump

For Ultrium 3 drives only. Copies information from the active dump area in drive memory to non-volatile memory in the drive. Perform this function **before** removing a failing drive. The preserved dump information is used by the Repair center to assist in failure analysis of the drive.

When taking a PRESERVE DUMP on a drive, the screen will post the following:

Dx (where x is the number of the drive being used): Presv Dump
Run Time X:XX (where X:XX represents the time the diagnostic is taking and increments in steps of 10 seconds)

Wait until the following screen displays:


















Push the action button. This determines that the command has completed and you can now proceed with the remove drive procedure.

Fast Read/Write

The drive reads and writes two wraps worth of data (a trip down and back) in each of the four data sections. This test takes approximately five minutes.

Path: Main Menu → Tools Menu → Drive Maint

Selection	Description/Result
 Step 1 From the Tools menu, press  until  is highlighted, then press  .	Runs Drive Maintenance test. Note: During drive maintenance tests, cartridges are automatically moved between IO and cartridge slots. Be sure to remove media from the IO until you are prompted to insert scratch media.
 Step 2 A warning message is displayed. Press  to continue with the test.	Attention: For all Read/Write tests, the content of the cartridge will be destroyed when running the test.
 Step 3 Press  or  to select the drive that you want to run the test on.	
Step 4 Press  to move to the next option.	

Selection	Description/Result
<div>  Drive D1 ▾  POST ▾ </div> <p>Step 5 Press ▲ or ▼ to select the test you want to run.</p>	<p>Available options are:</p> <ul style="list-style-type: none"> • POST (Power-On Self Test) • Fast R/W • Normal R/W • Media R/W • Head R/W • Wrap • Create FMR • Clear FMR • Drive Logs • Preserve Dump <p>Attention: Do not run the wrap test with a single-ended terminator. Use only the terminator that is shipped with the product. For HVD drives, use terminator Part No. 19P0378. For LVD drives, use terminator Part No. 19P0874.</p>
<p>Step 6 Press ► until  is highlighted, then press . The test begins. You can press  at any time to cancel the test.</p>	<p>The display will return to the Main menu, and the library will be returned to online.</p>

Manufacturing Test




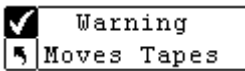

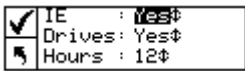
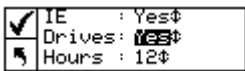
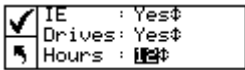
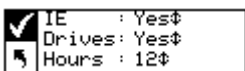


Manufacturing Test operates the robotics by moving tape cartridges from slot to slot. This test verifies that the library is functioning correctly.



Attention

This menu option is available for non-partitioned libraries only.



Path: Main Menu → Tools Menu → Mfg. Test

Selection	Description/Result
 <p>Step 1 From the Tools menu, press ► until  is highlighted, then press .</p>	Runs Manufacturing test.
 <p>Step 2 You will be prompted with a warning. Press  to continue the test.</p>	Attention: This test will move your cartridges and may change your inventory information by not placing cartridges in the same locations.
 <p>Step 3 Press ▲ or ▼ to select or deselect the I/O slot.</p>	Available options are: yes Includes the I/O slot in the cartridge swap cycle no Does not load or unload a cartridge to the I/O slot
<p>Step 4 Press ► to move to the next option.</p>	
 <p>Step 5 Press ▲ or ▼ to select or deselect the Drives slot.</p>	Available options are: yes Includes the drives in the cartridge swap cycle no Does not load or unload a cartridge to the drives
<p>Step 6 Press ► to move to the next option.</p>	
 <p>Step 7 Press ▲ or ▼ to select the number of hours to run the manufacturing test.</p>	You can select between 0 and 72 hours.
 <p>Step 8 Press ► until  is highlighted, then press .</p>	The Manufacturing test begins.





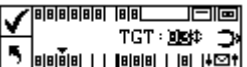


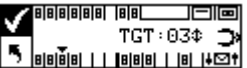



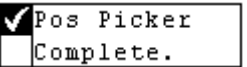

Selection	Description/Result
<div> <div>Cycle 0001</div> <div>Time 0:00 / 1h</div> </div> <p>Step 9 A status screen will display the progress of the test. You can press  at any time to cancel the test.</p>	
<p>Step 10 When the test is complete, a completion message is displayed. Press  to dismiss.</p>	<p>The display will return to the Main menu, and the library will be returned to online.</p>

Position Picker

Position Picker enables you to move the picker inside the library to a specified location. If you need to remove a cartridge manually from the picker, you can position the picker to point to a slot in a magazine near the front door. If you need to remove a cartridge manually from the rear slots or drives, you can move the picker away from the slot you need to access.



Path: Main Menu → Tools Menu → Pos Picker




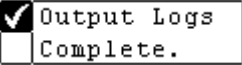

Selection	Description/Result
 <p>Step 1 From the Tools menu, press  until  is highlighted, then press .</p>	
 <p>Step 2 Press  or  to select the target slot to move the picker to.</p>	TGT Target slot to position the picker in front of.
 <p>Step 3 Press  until  is highlighted, then press .</p>	The picker moves to the specified position.
 <p>Step 4 When the picker is positioned, a completion message is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be returned to online.

Output Logs

Output Logs exports the log files to the serial port. If you are having problems with your library, you may be asked to output the logs and send them to IBM Technical Support for analysis.



Path: Main Menu → Tools Menu → Output Logs



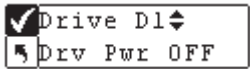


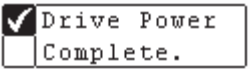





Selection	Description/Result
 <p>Step 1 From the Tools menu, press ► until  is highlighted, then press .</p>	Outputs logs.
 <p>Step 2 When the output is complete, a completion message is displayed. Press  to dismiss.</p>	The display will return to the Main menu, and the library will be returned to online.

Drive Power On/Off

Drive Power On/Off either prepares a drive to be removed or reactivates a drive once it has been installed. When you remove a drive, the drive is taken offline and is unavailable for use. Replacing a drive will reinitialize the drive sled.



Path: Main Menu → Tools Menu → Drv Pwr On/Off

Selection	Description/Result
 <p>Step 1 Press .</p>	Prepares a drive to be removed or replaced.
 <p>Step 2 Press  or  to select a drive.</p>	
 <p>Step 3 Press  until  is highlighted, then press .</p>	
 <p>Step 4 Press .</p>	<p>The drive is ready to be removed.</p> <p>The display will return to the Main menu, and the library will be returned to online.</p>

Chapter 7. Ultrium Media

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

Figure 64 shows the IBM TotalStorage LTO Ultrium 400 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 |

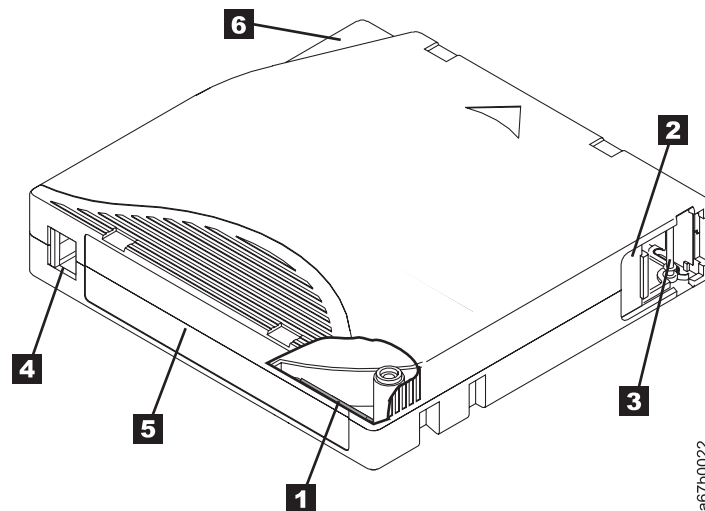


Figure 64. The IBM TotalStorage LTO Ultrium 400 GB Data Cartridge

Data Cartridge

Attention

If your library contains a bar code reader/scanner, it is strongly recommended that each data and cleaning cartridge have a bar code label.

The different generations of IBM TotalStorage Ultrium data cartridges can be identified by color:

Data Cartridge	Case Color
Ultrium 3 WORM	Slate blue top; platinum (silvery gray) bottom
Ultrium 3	Slate blue
Ultrium 2	Purple
Ultrium 1	Black

All three generations contain 1/2-inch, dual-coat, metal-particle tape. The native data capacity of Ultrium data cartridges is as follows:

Data Cartridge	Native Data Capacity
Ultrium 3 WORM	400 GB (800 GB at 2:1 compression)
Ultrium 3	400 GB (800 GB at 2:1 compression)
Ultrium 2	200 GB (400 GB at 2:1 compression)
Ultrium 1	100 GB (200 GB at 2:1 compression)

When processing tape in the cartridges, Ultrium Tape Drives use a linear, serpentine recording format.

- The Ultrium 3 drive reads and writes data on 704 tracks, 16 tracks at a time.
- The Ultrium 2 drive reads and writes data on 512 tracks, 8 tracks at a time.
- The Ultrium 1 drive reads and writes data on 384 tracks, 8 tracks at a time.

The first set of tracks (16 for Ultrium 3; 8 for Ultrium 2 and 1) 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 tracks for the return pass. This process continues until all tracks are written and the cartridge is full, or until all data is written.

The cartridge door (**2** in Figure 64 on page 163) 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 the cartridge is inserted into the drive, a threading mechanism pulls the pin (and tape) out of the cartridge, across the drive head, and onto a non-removable take-up 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 (see “Write-Protect Switch” on page 169). The label area (**5**) provides a location to place a label (see “Bar Code Label” on page 167). The insertion guide (**6**) is a large, notched area that prevents the cartridge from being inserted incorrectly.

You can order tape cartridges with bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see “Ordering Media Supplies” on page 181.

All generations of the LTO Ultrium Data Cartridge have a nominal cartridge life of 5000 load and unload cycles.

Capacity Scaling

To control the capacity of the cartridge (for example, to obtain a faster seek time) issue the SCSI command SET CAPACITY. For information about this command, refer to the *IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference*.

WORM (Write Once, Read Many)

Certain records retention and data security applications require a Write Once, Read Many (WORM) method for storing data on tape. To meet this data storage requirement, a new WORM feature has been made available on IBM LTO Ultrium generation 3 drives. The WORM feature can be enabled by upgrading to WORM-capable drive firmware and using a special WORM tape cartridge (see “WORM Media”).

No physical hardware changes are required to make Ultrium 3 drives compatible with the WORM feature; however, appropriate WORM-capable drive firmware must be installed. See “Requirements” on page 166 for minimum drive firmware requirements.

WORM Media

Because standard read/write media are incompatible with the WORM feature, a specially formatted WORM tape cartridge (see Figure 65) is required. Each WORM cartridge has a unique, worldwide cartridge identifier (WWCID), which comprises the unique CM chip serial number and the unique tape media serial number. See “Ordering Media Supplies” on page 181 for information on how to choose and purchase the appropriate WORM tape cartridges for your library.

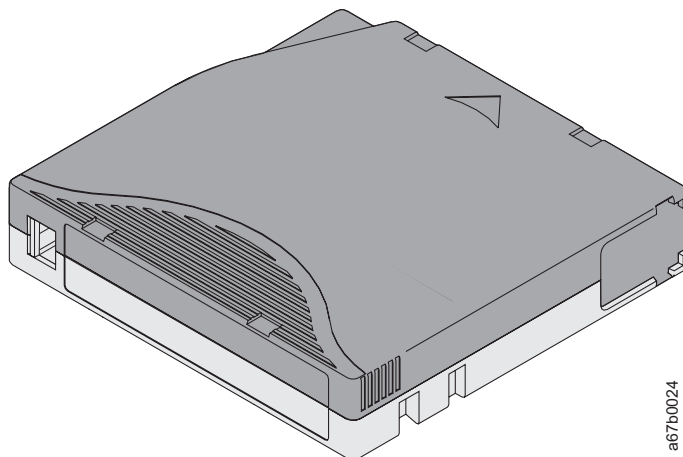


Figure 65. Ultrium 3 WORM Tape Cartridge

Data Security on WORM Media

Certain built-in security measures help ensure that the data written on a WORM cartridge does not become compromised, for example:

- The format of an IBM Ultrium 3 400 GB WORM Tape Cartridge is unlike that of standard read/write media. This unique format prevents a drive that lacks WORM-capable firmware from writing on a WORM tape cartridge.
- When the drive senses a WORM cartridge, the firmware prohibits the changing or altering of user data already written on the tape. The firmware keeps track of the last appendable point on the tape.

WORM Media Errors

The following conditions cause WORM media errors to occur:

- Information in the servo manufacturer's word (SMW) on the tape must match information from the cartridge memory (CM) module in the cartridge. If it does not match, a media Error Code 7 will post on the drive's single-character display (SCD).
- Inserting a WORM tape cartridge into a drive that is not compatible with WORM causes the cartridge to be treated as an unsupported medium. The drive will report a media Error Code 7. Upgrading the drive firmware to the correct code level will resolve the problem.

Requirements

To add WORM capability to your IBM LTO Ultrium generation 3 drive(s), you need the following:

- IBM Ultrium 3 400 GB WORM tape cartridge(s) (see "Ordering Media Supplies" on page 181)
- Firmware release 54xx or higher


Note: See "Firmware Upgrades" on page 229 for instructions on upgrading drive firmware.

Cleaning Cartridge

Attention

If your library contains a bar code reader/scanner, it is strongly recommended that each data and cleaning cartridge have a bar code label.

With each drive, a universal IBM LTO Ultrium Cleaning Cartridge is supplied to clean the drive heads. The drive itself determines when a head needs to be

cleaned. It alerts you by displaying  on the single-character display and the status light flashing amber. To clean the head, insert the cleaning cartridge into the cartridge load compartment. The drive performs the cleaning automatically. When the cleaning is finished, the drive ejects the cartridge.

Note: If a cleaning cartridge is inserted when the drive does not need to be cleaned or when the cartridge has expired, the drive will automatically eject the cartridge. (The IBM Cleaning Cartridges are valid for 50 uses.)

To remove a cleaning cartridge, see "Export Cleaning Cartridge" on page 129.

Bar Code Label

Attention

If your library contains a bar code reader/scanner, it is strongly recommended that each data and cleaning cartridge have a bar code label.

A bar code label contains:

- A volume serial number (VOLSER) that is human-readable
- A bar code that a bar code reader can read

Table 10. Bar code label requirements for Ultrium tape drives and libraries

Ultrium Tape Drive/Library	Bar Code Label Requirements
3580	Not required
3581	Required (with Bar Code Reader option)
3582	Required
3583	Required
3584	Required

When read by a bar code reader, the bar code identifies the cartridge's VOLSER to the library. The bar code also identifies the cartridge is a data cartridge or cleaning cartridge. In addition, the bar code includes the two-character media-type identifier Lx, where x equals 1, 2, 3, or T. 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; and 3 indicates that the cartridge is the third generation of its type; and T indicates a third generation WORM cartridge. Figure 66 on page 168 shows a sample bar code label for the LTO Ultrium Tape Cartridge.

Tape cartridges can be ordered with the labels included or with custom labels. To order tape cartridges and bar code labels, see "Ordering Media Supplies" on page 181. Bar code usage in IBM tape products must meet predefined specifications. They include (but are not limited to):

- Eight uppercase alphanumeric characters, where the last two characters must be L3, L2, L1 or LT
- Label and printing to be non-glossy
- Nominal narrow line or space width of 0.423 mm (0.017 in.)
- Wide to narrow ratio of 2.75:1
- Minimum bar length of 11.1 mm (0.44 in.)

To determine the complete specifications of the bar code and the bar code label, visit the web at <http://www.ibm.com/storage/lto>, or contact your IBM Sales Representative.

When attaching a bar code label to a tape cartridge, place the label only in the recessed label area (see **5** in Figure 64 on page 163). A label that extends outside of the recessed area can cause loading problems in the drive.

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 a bar code reader from reading the label.

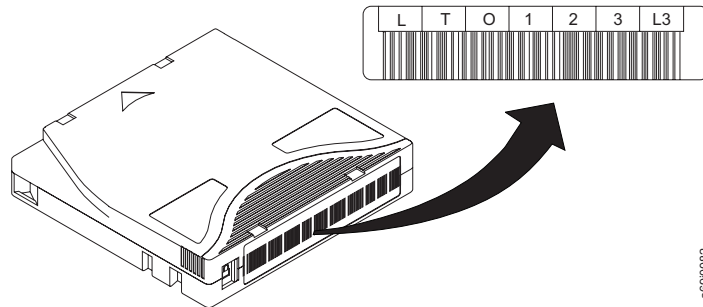


Figure 66. Sample bar code label on the LTO Ultrium 3 Tape Cartridge. The volume serial number (LTO123) and bar code are printed on the label.


Guidelines for Using Bar Code Labels

Apply the following guidelines whenever using bar code labels:

- Use only IBM-approved bar code labels on cartridges to be used in an IBM tape product.
- Do not reuse a label or reapply a used label over an existing label.
- Before applying 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 being removed. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger. Do not use a sharp object, water, or a chemical to clean the label area.
- Examine the label before applying it to the cartridge. Do not use the label if it has voids or smears in the printed characters or bar code (a library'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 64 on page 163).
- 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 drive to load the cartridge.

Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 67) determines whether you can write to the tape. If the switch is set to the:

- The locked position  (solid red), data cannot be written to the tape.
- The unlocked position (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 (blank) data cartridge. Do not write-protect scratch (blank) cartridges; the tape drive will not be able to write new data to them.

If you must manually set the write-protect switch, slide it left or right to the desired position.

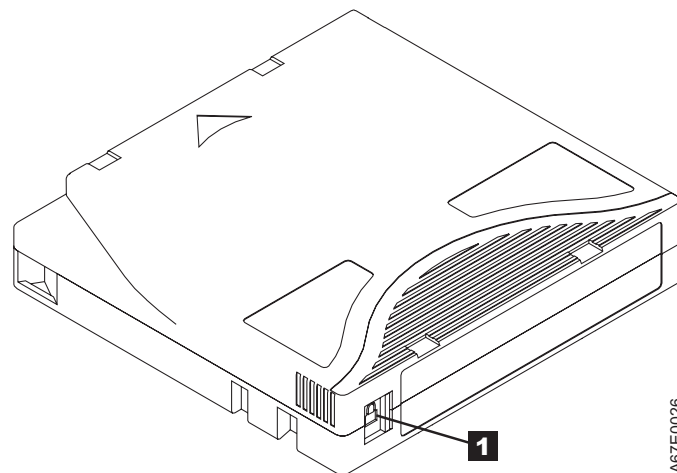


Figure 67. Setting the write-protect switch

Handling the Cartridges

Attention

Do not use a damaged tape cartridge. 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.

Incorrect handling or an incorrect environment can damage 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 guidelines described below.

Provide Training

- Post procedures that describe proper media handling in places where people gather.
- Ensure that anyone who handles cartridges 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 shipping a cartridge, use the 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 68). They are available at <http://www.turtlecase.com>.



Figure 68. 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 69 on page 171).

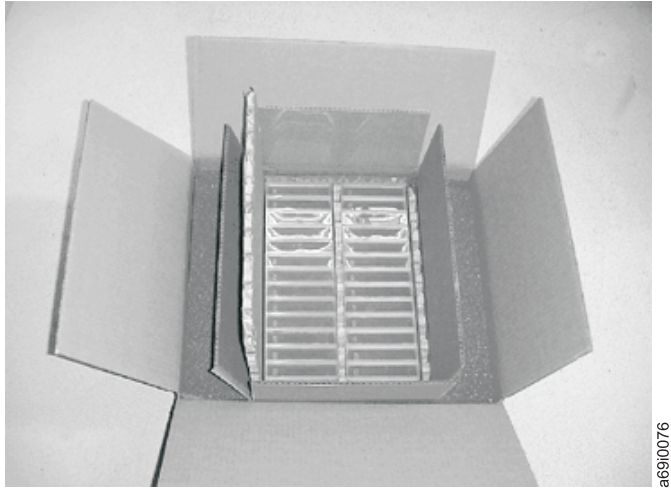


Figure 69. Double-boxing tape cartridges for shipping

Provide Proper Acclimation and Environmental Conditions

- Before using a cartridge, let it acclimate to the normal operating environment for 1 hour. If condensation is visible on the cartridge, wait an additional hour.
- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not expose the cartridge to moisture or direct sunlight.
- Do not expose recorded or blank cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment, or fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in “Environmental and Shipping Specifications for Tape Cartridges” on page 180.

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 loads first into the cartridge load compartment) and ensure that there are no gaps in the seam of the cartridge case (see **1** in Figure 70 on page 172 and **4** in Figure 72 on page 175). If there are gaps in the seam (see Figure 70 on page 172), the leader pin may be dislodged. Go to “Repositioning or Reattaching a Leader Pin” on page 174.

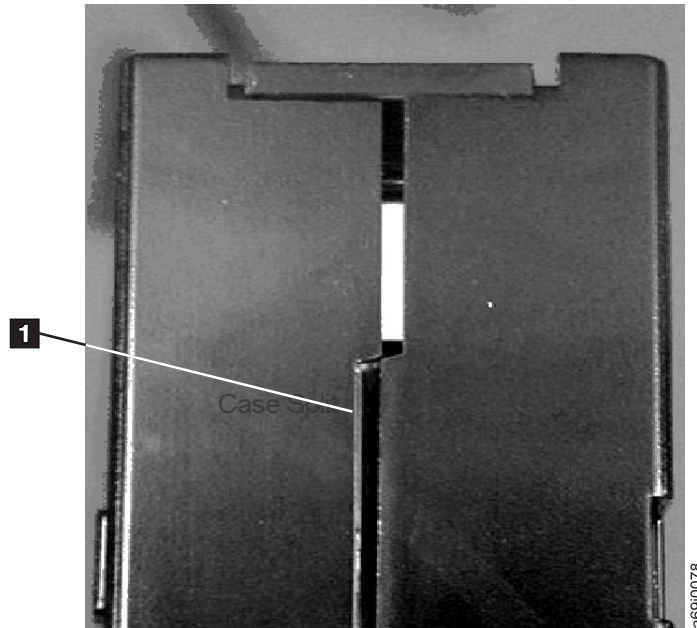


Figure 70. Checking for gaps in the seams of a cartridge

- Check that the leader pin is properly seated (see **2** in Figure 71 on page 174).
- If you suspect that the cartridge has been mishandled but it appears usable, copy any data onto a good cartridge immediately for possible data recovery. Discard the mishandled cartridge.
- 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 71 on page 174). If the leader pin has become dislodged, go to “Repositioning or Reattaching a Leader Pin” on page 174.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape’s surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Do not stack more than six cartridges.
- Do not degauss a cartridge that you intend to reuse. Degaussing makes the tape unusable.

Examples of Cartridge Problems

Example: Split Cartridge Case (see Figure 70 on page 172)

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 174). Then, immediately use data recovery procedures to minimize chances of data loss.
3. Review media-handling procedures.

Example: Improper Placement of Leader Pin (see Figure 71 on page 174)

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 174). Then, immediately use data recovery procedures to minimize chances of data loss.

Repositioning or Reattaching a Leader Pin

Attention

Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

If the leader pin in your cartridge becomes dislodged from its pin-retaining spring clips or detaches from the tape, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reposition or reattach it. (Do not reattach the pin if you must remove more than 7 meters (23 feet) of leader tape.) The sections that follow describe each procedure.

Repositioning a Leader Pin

A leader pin that is improperly seated inside a cartridge can interfere with the operation of the drive. Figure 71 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)

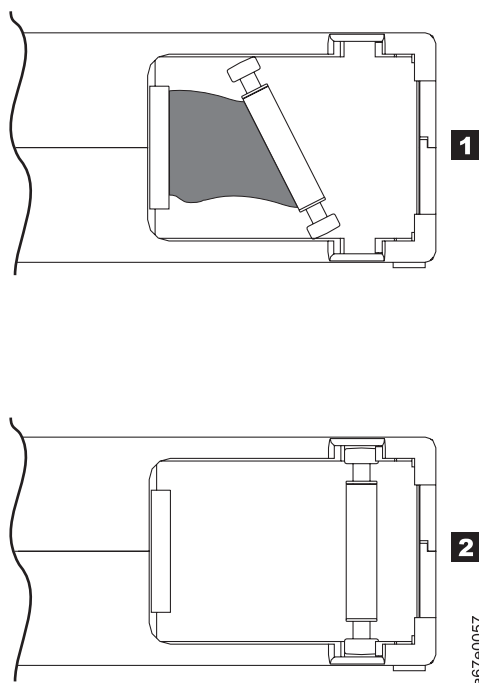


Figure 71. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (**1** in Figure 72) 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.
4. Close the cartridge door.

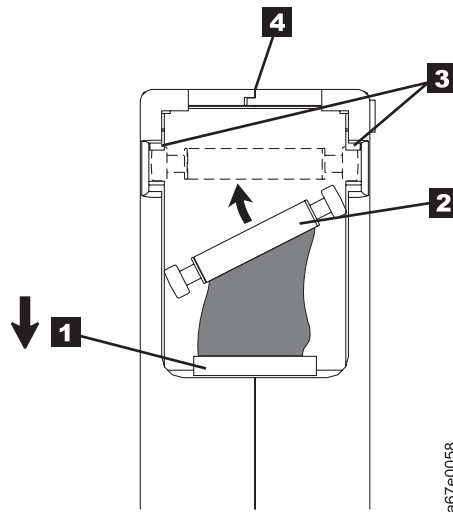


Figure 72. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (**1** in Figure 73) into the cartridge's hub (**2**) and turn it clockwise until the tape becomes taut.

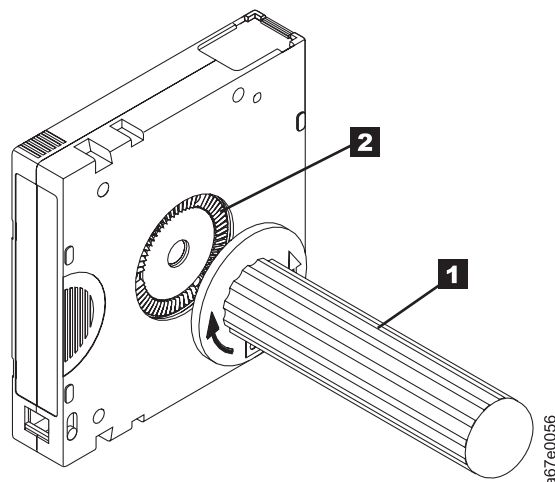


Figure 73. Rewinding the tape into the cartridge

6. Remove the rewind tool by pulling it away from the cartridge.
7. 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.

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 74). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure 74). 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 74). 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.

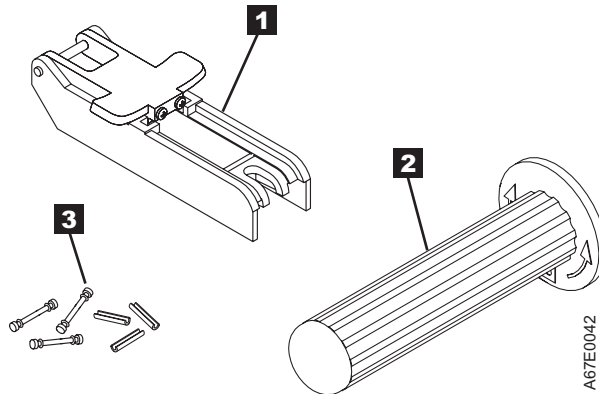


Figure 74. Leader Pin Reattachment Kit

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 75) to the cartridge (**2**) so that the tool's hook (**3**) latches into the cartridge's door (**4**). Pull the tool back to hold the door open, then slide the tool onto the cartridge. Open the tool's pivot arm (**5**).

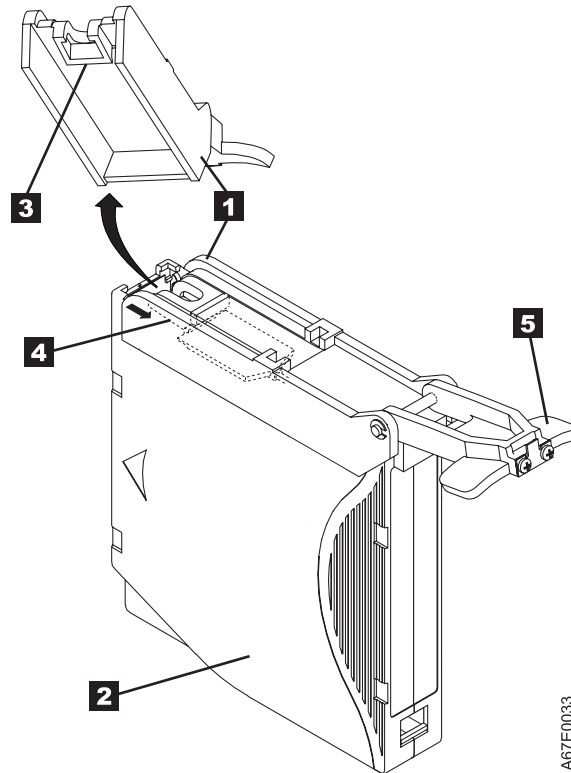


Figure 75. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 76) 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.

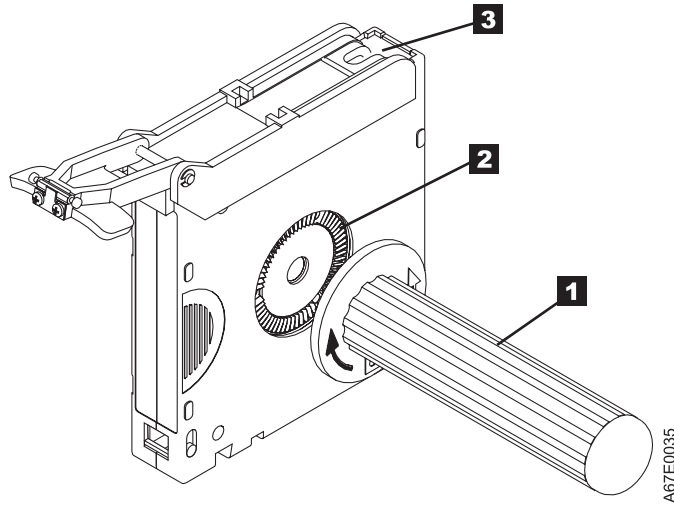


Figure 76. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (**1** in Figure 77), 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.

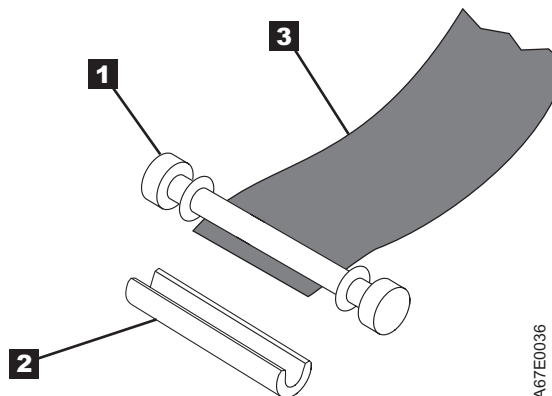


Figure 77. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure 78).
8. Place a new C-clip into the retention groove **2** (Figure 78) 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 178) into the cavity **3** (Figure 78) 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 78).

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.

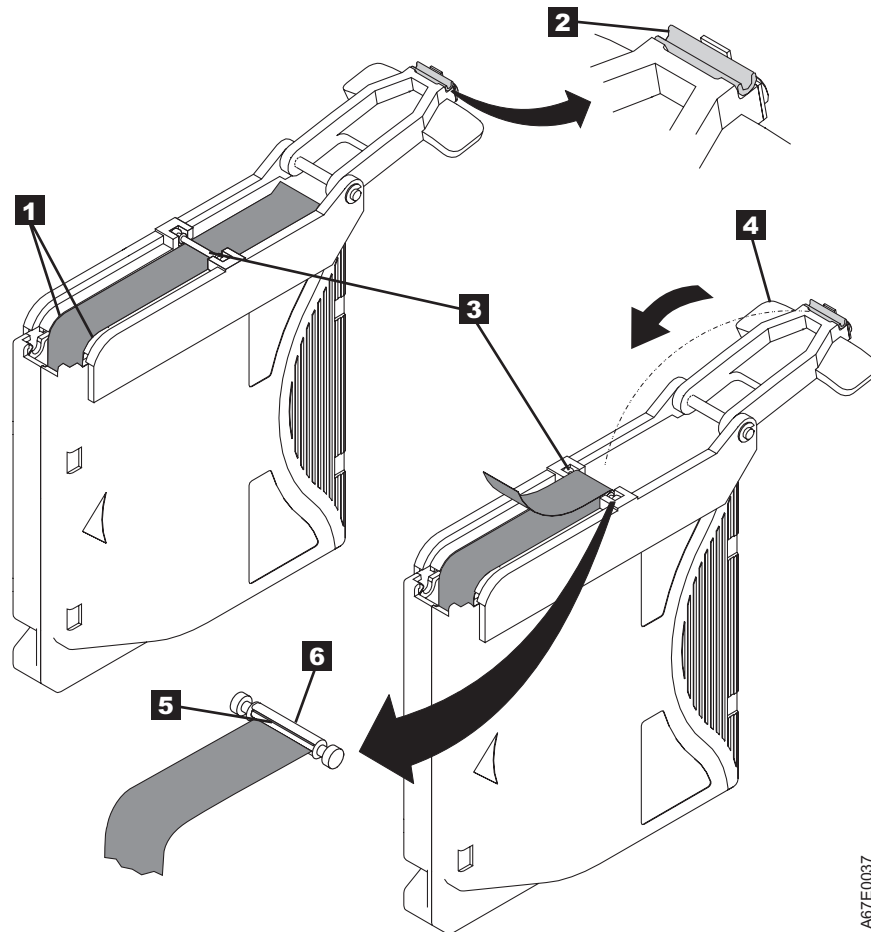


Figure 78. Attaching the leader pin to the tape

11. Close the pivot arm **4** of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.

12. Swing the pivot arm open and trim the excess tape **5** so that it is flush with the reattached leader pin **6**.
13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.
15. Remove the rewind tool.
16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.

Attention

Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

Environmental and Shipping Specifications for Tape Cartridges

Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation in the drive (the time will vary, depending on the environmental extremes to which the cartridge was exposed).

The best storage container for the cartridges (until they are opened) is the original shipping container. The plastic wrapping prevents dirt from accumulating on the cartridges and partially protects them from humidity changes.

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

Table 11. Environment for operating, storing, and shipping the LTO Ultrium Tape Cartridge

Environmental Factor	Environmental Specifications			
	Operating	Operational Storage ¹	Archival Storage ²	Shipping
Temperature	10 to 45°C (50 to 113°F)	16 to 32°C (61 to 90°F)	16 to 25°C (61 to 77°F)	–23 to 49°C (–9 to 120°F)
Relative humidity (noncondensing)	10 to 80%	20 to 80%	20 to 50%	5 to 80%
Maximum wet bulb temperature	26°C (79°F)	26°C (79°F)	26°C (79°F)	26°C (79°F)
Notes: 1. Operational storage equals less than 1 year. 2. Archival storage equals 1 to 10 years.				

Disposing of Tape Cartridges

Under the current rules of the U.S. Environmental Protection Agency (EPA), regulation 40CFR261, the LTO Ultrium Tape Cartridge is classified as non-hazardous waste. As such, it may be disposed of in the same way as normal office trash. These regulations are amended from time to time, and you should review them at the time of disposal.

If your local, state, country (non-U.S.A.), or regional regulations are more restrictive than EPA 40CFR261, you must review them before you dispose of a cartridge. Contact your account representative for information about the materials that are in the cartridge.

If a tape cartridge must be disposed of in a secure manner, you can erase the data on the cartridge by using a high-energy ac degausser (use a minimum of 1200 oersted peak field over the entire space that the cartridge occupies). Degaussing makes the cartridge unusable.

If you burn the cartridge and tape, ensure that the incineration complies with all applicable regulations.

Ordering Media Supplies

Table 12 lists the cartridges and media supplies that you can order for the library.

Table 12. Ordering media supplies for the Autoloader

Supply Item	Methods of Ordering
IBM TotalStorage LTO Ultrium 400 GB Data Cartridge Bar code labels are pre-applied to cartridges.	<ul style="list-style-type: none">• Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 009. Specify the VOLSER characters that you want.• Order as part number 96P1470 (color label) or 96P1471 (black and white label) through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media). Or, call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium 400 GB Data Cartridge Order VOLSER labels separately.	<ul style="list-style-type: none">• Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 008.• Order as part number 24R1922 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media). Or, call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Bar code labels are pre-applied to cartridges.	<ul style="list-style-type: none">• Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 006. Specify VOLSER characters you want.• call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Order VOLSER labels separately (see “Ordering Bar Code Labels” on page 183).	<ul style="list-style-type: none">• Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 007.• call 1-888-IBM-MEDIA.

Table 12. Ordering media supplies for the Autoloader (continued)

Supply Item	Methods of Ordering
IBM LTO Ultrium 100 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 183).	<ul style="list-style-type: none"> Order as part number 08L9120 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media), or if you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative, or call 1-888-IBM-MEDIA.
IBM Ultrium 3 400 GB WORM Tape Cartridge (with label attached) (3589 Model 028/Feature Code 2820 is a 20-pack of WORM cartridges labeled with starting volume serial information and, optionally, packed in individual jewel cases.)	<ul style="list-style-type: none"> Order by Machine Type/Model and Feature Code 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 Ultrium 3 400 GB WORM Tape Cartridge (without label attached) (3589 Model 029/Feature Code 2920 is a 20-pack of WORM cartridges packed in individual jewel cases with unattached blank labels.)	<ul style="list-style-type: none"> Order by Machine Type/Model and Feature Code 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, Ultrium 2, and Ultrium 3 drives) VOLSER labels are included.	<ul style="list-style-type: none"> Order as part number 35L2086 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media), or if you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative, or 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).
Manual Rewind Tool	Order as part number 08L9130 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media).

Ordering Bar Code Labels

You can order bar code labels directly from the authorized label suppliers listed below.

Table 13. Authorized suppliers of custom bar code labels

In America	In Europe and Asia
EDP/Colorflex 2550 W. Midway Blvd. Broomfield, CO 80020 U. S. A. Telephone: 800-522-3528 http://www.colorflex.com/	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 P.O. Box 740947 Houston, TX 77274 U. S. A. Telephone: 800-426-4844 http://www.datawarelabels.com/	Dataware Labels Europe Heubergstrasse 9 D-83052 Bruckmuhl-Gotting Germany Telephone: 49 8062-9455 http://www.datawarelabels.com/
NetC P. O. Box 1067 Fairfield, CT 06825 U. S. A. Telephone: 203-372-6382 http://www.netc11c.com/	NetC Europe Ltd Town Farm Bungalow The Pavement North Curry TA3 6LX Somerset U. K. Telephone: 44 (0) 1823 49 1439 http://www.netclabels.co.uk
	NetC Asia Pacific Pty Ltd Locked Bag 1 Kenthurst NSW 2156 Australia Telephone: 61 (0) 2 4573 6556 http://www.netclabels.com.uk

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Chapter 8. Troubleshooting and Diagnostics

If you encounter problems when running the library, refer to the section below. If the problem is not identified in this section, visit the web at <http://www.ibm.com/storage/lto>.

Maintenance/Service Starting Point

Begin all maintenance or service activity here.

Many problems can be resolved by a firmware upgrade. Ensure that both the library and drive firmware are at the latest levels available. Compare the firmware levels on the Operator Panel Status Menu with the latest levels on the web site, <http://www.ibm.com/storage/lto> or <ftp://index.storsys.ibm.com/358x>. See “Firmware Upgrades” on page 229.

Most library or drive errors will result in an error code or error message on the Operator Panel display. An error code history is maintained in the library or drive error log.

The table below lists possible reasons for service and the associated service action. Find the *reason you are here* in the left column and *perform the action* listed in the right column. If the action leads to removal and replacement of the drive or other Customer Replaceable Unit (CRU), or if you are unable to resolve the problem, see “Contacting IBM Technical Support” on page 205.

Table 14. Start Here

If You Are Here For This Reason	... Perform This Action
A Library error code or error message is displayed on the Operator Panel display, in the error log, on the Host, or on the RMU display.	See “Library Error Messages” on page 191.
A Drive error code or error message is displayed on the Operator Panel display, in the error log, on the Host, or on the RMU display.	See “Library Error Messages” on page 191.
A TapeAlert message from the host	See Appendix D, “TapeAlert Flags,” on page 271.
The Drive ‘Cleaning Required’ icon on the Operator Panel is ON.	Perform the Clean Drive procedure. See “Clean Drive” on page 151.
The Library does not power ON.	<ol style="list-style-type: none">1. Ensure that the power cord is plugged into the library and the electrical outlet.2. Try another electrical outlet or plug another device into this outlet to test.3. Try another power cord.4. Replace the base unit. See “Contacting IBM Technical Support” on page 205.

Table 14. Start Here (continued)

If You Are Here For This Reason	. . . Perform This Action
No air flow from the cooling fan in one of the drives.	If you have 2 drives installed, swap the drives to determine if the problem is with the drive or the location in the base unit. If the problem is with the drive, replace the drive. If the problem is with the base unit, replace the base unit. See "Contacting IBM Technical Support" on page 205.
The Operator Panel display is blank, hung, or frozen.	Gather all failure information available, ensure that power is being applied to the library, cycle the power OFF then ON, load the latest level of firmware, if possible. If the display is still failing, replace the base unit.
A tape is stuck in the drive, or a cartridge is stuck in the library or picker.	See "Manual Removal of Tapes" on page 201 -- or -- IBM Service personnel only - See Appendix F, "Removing a Tape Cartridge," on page 277.
Reposition/Reattach a leader pin.	See "Repositioning or Reattaching a Leader Pin" on page 174.
Suspected media problem.	See "Drive Error Codes" on page 195. Use Error Code 6, Tape Drive or Media Error, or Error Code 7, High Probability of Media Error. If the tape is stuck, see "Manual Removal of Tapes" on page 201.
Fibre Channel service or error messages from the host.	See "Fixing Fibre Channel Errors" on page 252.
SCSI errors from host.	See "Fixing SCSI Bus Errors" on page 254.
Excessive temporary errors reported to the host.	1. Clean the drive. See "Clean Drive" on page 151. 2. Run Normal Read/Write Diagnostic. See "Drive Maintenance Test" on page 155.
Suspected firmware (microcode) problem.	Update the firmware. See "Firmware Upgrades" on page 229. For drive firmware problems, see "Drive Error Codes" on page 195. Use error code 3 or 4. If new firmware does not resolve the problem, contact IBM Technical Support.
Update firmware (microcode) on the library or drive.	See "Firmware Upgrades" on page 229.
Copy an Error log or Trace log or microcode dump to the host.	See "LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool" on page 231 and "Diagnostics File Page" on page 31.
Obtain drive or library error information at the server (host).	See Appendix A, "Messages," on page 243.

Table 14. Start Here (continued)

If You Are Here For This Reason	. . . Perform This Action
Remove/Replace Customer Replaceable Units (CRU's).	See "Removing/Replacing a Drive" on page 208. -- or -- See "Removing/Replacing a Base Unit" on page 219. -- or -- See "Removing/Replacing a Bar Code Scanner" on page 211. -- or -- See "Removing/Replacing an RMU" on page 217. -- or -- See "Replacing the Input/Output (I/O) Door" on page 224.
Run library diagnostic tests.	See "Verify Library Test" on page 154.
Run drive diagnostic tests.	See "Drive Maintenance Test" on page 155.
Analyze suspected RMU problems.	See "RMU Analysis Procedure" on page 203.
Analyze suspected Bar Code Scanner problems.	See "Bar Code Scanner Analysis Procedure" on page 204.
Contact IBM Technical Support	See "Contacting IBM Technical Support" on page 205.
Perform Safety Inspection of the library.	See "Performing the Safety Inspection Procedure" on page xv.

Installation Problems

Usually, problems encountered during the installation of your library are caused by improper SCSI bus configuration-application-software configuration or by an OS that has not been correctly configured. If the application software that you are attempting to use is not communicating with your library after installation, check the following:

SCSI IDs

Make sure that the IDs you selected for the library robotics and tape drive are not the same as the ID used by any other SCSI device on that bus, including the host SCSI adapter card.

SCSI Cabling

Verify that all SCSI cables are securely connected at both ends and that the jack screws are secured. Also, check the length and integrity of your SCSI cabling. The total length of a SCSI bus must not exceed 12 meters (39.4 feet). Replace suspect cables with known good cables.

Note: The length of the internal SCSI cabling inside your library is one foot for each drive. This length must be included in any calculations of bus length.

Termination

Check that all SCSI buses are properly terminated.

Compatibility

Ensure that your library and its tape drives are compatible with the SCSI adapter card and application software that you plan to use.

SCSI Adapter Card Installation

Verify that you have installed your SCSI adapter card correctly. Refer to the documentation that came with your card for installation and troubleshooting instructions. Pay particular attention to any steps describing the settings of various jumpers or switches on the card. Check that the card is seated fully in the I/O connector.

Note: For a list of compatible SCSI adapters and application software, check with your application software vendor.

Application Software Installation

Refer to the documentation included with your software for instructions on how to verify installation.

Library Error Messages

If an error occurs during the operation of your library, an error message will be displayed on the operator's LCD. Table 15 lists library error messages; "Drive Error Codes" on page 195 lists drive error messages.

SAC Codes

Table 15. SAC Codes

SAC Code	Error Message	Description	Recommended Action
00h	Unknown Error	An unexpected error has occurred.	Capture the support and error logs and provide them to service.
01h	OS Error Reboot System	Operating System Error	Reboot the system.
02h	Z80 Error	A robot controller, OCP controller board, or XA main controller board hardware problem exists and requires replacement.	
03h	OCP Error		
04h	XA Error		
05h	SW Error	Application Software (firmware) Error	Capture the support and error logs.
10h	SN Missing	The system serial number is missing in NVRAM. The system cannot go online if a serial number is not entered. This problem may occur if the main board has been exchanged or NVRAM has been corrupted due to a code problem or a bad NVRAM chip.	
14h			
15h	Scanner Error	The bar code scanner is not functioning properly.	
16h	Bar Code Error Check Tape	The scanned bar code is incorrect for your current configuration. This is most likely the result of a missing or unreadable bar code or a bar code length that does not match the mode you configured (such as Default, Media ID, or Extended).	Check bar code scanner configuration. See "Configure Bar Code Scanner" on page 120 for more information.
38h	RMU Problem Check RMU	The RMU has reported an error to the library.	Make sure the RMU is configured correctly, is operational, and is accessible on the network.
39h			

Table 15. SAC Codes (continued)

SAC Code	Error Message	Description	Recommended Action
40h	CFG Mismatch	The firmware detects that the code configuration does not match the hardware configuration. This may happen when the wrong firmware is loaded (for example, an LTO code image is loaded to a DLT system).	Reboot the system..
70h 81h 82h	Picker Error Reset System	The picker was unable to perform a requested command.	Assure that the picker path is clear and that cartridges are properly inserted into storage and I/O slots, as well as drive locations. Reboot the system.
80h E0h	Obstruction Check Picker	The picker has reported a move failure, which may be caused by an obstruction of the picker, such as partially extended cartridges into the picker path, an ejected cartridge from a drive, or a cartridge within the picker partially extending out of the picker.	Try to clear the obstruction.
81h 82h 70h	Picker Error Reset System	The picker was unable to perform a requested command.	Assure that the picker path is clear and that cartridges are properly inserted into storage and I/O slots, as well as drive locations. Reboot the system.
82h 81h 70h	Picker Error Reset System	The picker was unable to perform a requested command.	Assure that the picker path is clear and that cartridges are properly inserted into storage and I/O slots, as well as drive locations. Reboot the system.
90h	Drive Error Check Drive	Communication to a drive is not working, the drive is not initializing, or the drive is reporting a problem.	Reboot the system.
92h	DRV Invalid	Invalid Drive firmware	Reload drive firmware.
94h	Drive Media Error	Indicates drive media error.	Remove the suspect cartridge.

Table 15. SAC Codes (continued)

SAC Code	Error Message	Description	Recommended Action
A0h	RMU Com Error check RMU	The library firmware was able to communicate with the RMU, but did not detect any communication for more than 10 minutes. The RMU may have been removed or somehow has become nonoperational.	Reboot the system.
D0h	PS Failure	A library power supply failed or is not operating within specified ranges.	Reboot the system.
E0h 80h	Obstruction Check Picker	The picker has reported a move failure, which may be caused by an obstruction of the picker, such as partially extended cartridges into the picker path, an ejected cartridge from a drive, or a cartridge within the picker partially extending out of the picker.	Try to clear the obstruction.
EAh	Sled Missing Check Sled	A drive sled has been removed or is not connected properly.	Reinsert the sled or check the connections.
E2h	Security alert Check Door	The system has detected operator interference, such as an open door and magazine removal, or a host has issued a PREVENT MEDIA REMOVAL and a cartridge has been inserted or removed from the I/O slot.	Check and ensure that magazines are installed, the door is closed, and that the I/O slot is empty.
E3h E4h E5h E6h	SCSI Error Check SCSI	A SCSI connection problem has been detected.	Make sure that the cables are connected correctly, that the bus type is appropriate, and that the proper terminator is applied.
E7h E8h	Pick Failed Clear Picker Place Failed Clear Picker	The picker could not GET or PUT a cartridge. Typically this means a cartridge is still partially in the picker.	Remove the cartridge from the picker. For more information, see “Manual Removal of a Tape from the Picker” on page 202.

Table 15. SAC Codes (continued)

SAC Code	Error Message	Description	Recommended Action
E9h	Tape Recovered to Cell X	Informational message that indicates that a cartridge had been detected in the picker assembly and was placed in a lot location (X) to free the picker and make it operational.	Make sure that the cartridge belongs in the location it was placed. You might need to use the Move Media function to move the cartridge to the proper location.
F0h	Fan Failure	A library or drive fan failed.	Prevent the system from becoming too hot and either turn off the library or remove the drive with the bad fan.
F5h	Clean Needed Check drive X	A drive has been cleaned, but still requires cleaning. The cleaning cartridge might not function properly, might be expired, or the drive might be defective.	Retry the clean operation.
F6h	Tape Expired Eject Slot X	A cleaning cartridge is expired.	Export the cleaning cartridge and insert a new one.
F7h	No Clean Tape Insert Tape	A cleaning operation was attempted, but a cleaning cartridge is not configured, expired, or not available.	Insert a cleaning cartridge into the I/O slot or configure a cleaning slot and import a cleaning cartridge into that slot.
F8h	Tape Missing in Slot X	A previously configured cleaning cartridge is no longer found. It might have been removed manually, loaded in a drive, or recovered to a data slot.	Place the cartridge back to the slot.

Drive Error Codes

Errors and informational messages that pertain to the tape drive are shown in the drive status area of the Operator Panel. Table 16 describes the codes that display.

Note: In this table, *enclosure* refers to the 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.

Note: **For Ultrium 3 drives only.** If the error code action procedure leads to replacement of the tape drive, it is *very important* to preserve the active dump information in non-volatile storage **before** switching the library power OFF. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:



Path: Main Menu —> Tools Menu —> Drive Maint —> Presv Dump

For procedure instructions, see 156.

Attention: The Operator Panel displays an exclamation point before a drive error code. For example, '!6'.

Table 16. Drive error codes

Code	Cause and Action
0	<p>No error occurred and no action is required. This code displays:</p> <ul style="list-style-type: none"> • When power is cycled (turned off, then on) to the tape drive. • When diagnostics have finished running and no error occurred. <p>Note: The single-character display is blank during normal operation of the tape drive.</p>
1	<p>Cooling problem. The tape drive detected that the recommended operating temperature was exceeded. Perform the following action:</p> <ol style="list-style-type: none"> 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 16). 4. If the operating temperature is within the specified range and the problem persists, replace the tape drive. <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>
2	<p>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:</p> <ol style="list-style-type: none"> 1. Ensure that the drive sled is properly seated. 2. If the problem persists, replace the tape drive. <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>

Table 16. Drive error codes (continued)

Code	Cause and Action
3	<p>Firmware problem. The tape drive determined that a firmware error occurred. Perform the following action:</p> <ol style="list-style-type: none"> 1. Collect a drive dump from one of the following: Note: Do not force a new dump; the tape drive has already created one. <ul style="list-style-type: none"> • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the web at http://www.ibm.com/storage/lto. • Ultrium tape drive (to copy a drive dump, see "LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool" on page 231. • To determine where to send a file that contains a drive dump to be analyzed, contact your IBM Technical Support Center. 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 IBM Technical Support Center. <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>
4	<p>Firmware or tape drive problem. The tape drive determined that a firmware or tape drive hardware failure occurred. Perform the following action:</p> <ol style="list-style-type: none"> 1. Collect a drive dump from one of the following: Note: Do not force a new dump; one already exists. <ul style="list-style-type: none"> • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the web at http://www.ibm.com/storage/lto. • Ultrium tape drive (to copy a drive dump, see "LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool" on page 231. • To determine where to send a file that contains a drive dump to be analyzed, contact your IBM Technical Support Center. 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, run the Normal (long) Read/Write Test. (See "Drive Maintenance Test" on page 155.) <ul style="list-style-type: none"> • If the test failed, contact IBM Technical Support Center and replace the drive. • If the test passed, you may have a firmware problem. Ensure that you have the latest level of firmware, then contact IBM Technical Support Center and send them the drive dump that you collected in Step 1.
5	<p>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.</p>

Table 16. Drive error codes (continued)

Code	Cause and Action
6	<p>Tape drive or media error. The drive determined that an error occurred, but it cannot isolate the error to faulty hardware or to the cartridge. Perform the following action:</p> <p><u>For Problems with Writing Data:</u></p> <p>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 cartridge loaded in the drive when the problem occurred, retry the operation with a different cartridge:</p> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first drive and run the Normal Read/Write test (See “Drive Maintenance Test” on page 155): <ul style="list-style-type: none"> - 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 Normal Read/Write Test(see “Drive Maintenance Test” on page 155). <ul style="list-style-type: none"> – If the diagnostics fail, replace the drive. – If the diagnostics succeed, discard the cartridge that caused the problem. <p>If the problem occurs with multiple cartridges or if you do not know the cartridge’s volume serial number, run the Normal Read/Write test. (See “Drive Maintenance Test” on page 155.):</p> <ul style="list-style-type: none"> • If the diagnostics fail, replace the tape drive. • If the diagnostics succeed, run the Head Read/Write test (See “Drive Maintenance Test” on page 155.). <ul style="list-style-type: none"> – If the Head Read/Write diagnostic fails, replace the tape drive. – If the Head Read/Write diagnostic succeeds, replace the cartridges that caused the problem. <p>The error code clears when you remove the cartridge or place the drive in maintenance mode.</p> <p><u>For Problems with Reading Data:</u></p> <p>If the problem occurred while the drive was reading data from the tape, and if you know the volume serial number of the cartridge, perform one of the following procedures:</p> <ul style="list-style-type: none"> • If another drive is available, insert the cartridge into the other drive and retry the operation: <ul style="list-style-type: none"> – If the operation fails, discard the defective cartridge. – If the operation succeeds, insert a scratch cartridge into the first drive and run the Normal Read/Write test (See “Drive Maintenance Test” on page 155.): <ul style="list-style-type: none"> - 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 Normal Read/Write test (See “Drive Maintenance Test” on page 155.): <ul style="list-style-type: none"> – If the diagnostics fail, replace the drive. – If the diagnostics succeed, discard the cartridge that caused the problem. <p>If the problem occurs with multiple cartridges or if you do not know the cartridge’s volume serial number, run the Normal Read/Write test (See “Drive Maintenance Test” on page 155.):</p> <ul style="list-style-type: none"> • If the diagnostics fail, replace the tape drive. • If the diagnostics succeed, run the Head Read/Write test (See “Drive Maintenance Test” on page 155): <ul style="list-style-type: none"> – If the Head Read/Write Test fails, replace the tape drive. – If the Head Read/Write diagnostic succeeds, replace the cartridges that caused the problem. <p>The error code clears when you remove the cartridge or place the drive in maintenance mode.</p>

Table 16. Drive error codes (continued)

Code	Cause and Action
7	<p>A high probability of media error. The tape drive determined that an error occurred because of a faulty tape cartridge, an expired cleaning cartridge, an invalid WORM cartridge, the insertion of an FMR cartridge as a data cartridge, or the insertion of a WORM cartridge when the drive does not have the correct firmware level.</p> <ul style="list-style-type: none"> • If the problem only occurs with a cleaning cartridge, replace the cleaning cartridge. • If the problem was caused by an FMR cartridge that is no longer needed, go to “Drive Maintenance Test” on page 155 and perform <i>Clear FMR</i>. • Try another tape cartridge. If the problem only occurs with one cartridge, replace the failing cartridge. If the problem occurs with multiple cartridges, use the following procedure: <ol style="list-style-type: none"> 1. If possible, run the tape cartridges in a different drive. If the operation in the other drive fails with an error code of 6 or 7, replace the media. If the operation succeeds, run the Media Read/Write diagnostic test on all of the failing cartridges (see “Drive Maintenance Test” on page 155). 2. If the Media Test diagnostic test fails, replace the media. If it runs successfully, clean the drive. (See “Clean Drive” on page 151.) Then run the “Normal Read/Write” diagnostic test. (See “Drive Maintenance Test” on page 155.) 3. If the Normal Read/Write test fails, replace the drive. If the Normal Read/Write test runs successfully, the problem may have been corrected by cleaning the drive. Repeat the operation that produced the original media error. • Inserting a WORM cartridge into a drive that is not WORM-capable will result in the cartridge being ejected. The drive will report an Error Code 7. Upgrading the drive firmware to the correct code level will resolve the problem. <p>The error code clears when you remove the cartridge or place the drive in maintenance mode.</p>
8	<p>For SCSI drive:</p> <p>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 “Fixing SCSI Bus Errors” on page 254. The error code clears 10 seconds after the drive detected the error or when you place the drive in maintenance mode.</p> <p>For Fibre Channel drive:</p> <p>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. Check that each Fibre Channel cable meets the requirements specified in “Using the Fibre Channel Interface” on page 40. See “Fixing Fibre Channel Errors” on page 252. The error code clears when the drive detects light and can communicate, or when you place the drive in maintenance mode.</p>
9	<p>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.</p> <ul style="list-style-type: none"> • 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. • If the problem persists after replacing the drive, the problem is with the cable between the drive sled and the main board. Replace the base unit (see “Removing/Replacing a Base Unit” on page 219). <p>The error code clears when you place the drive in maintenance mode.</p>
o, c, b, or h	<p>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.</p>

Table 16. Drive error codes (continued)

Code	Cause and Action
A	<p>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, determine whether the problem is with the drive or the media.</p> <p>To determine if the problem is with the drive hardware or the tape media, perform the following procedures:</p> <p>Note: The drive is usable, although 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.</p> <ol style="list-style-type: none"> 1. If possible, run the tape cartridge in a different drive. If the operation in the other drive fails and 6 or 7 is displayed, replace the media. If the operation succeeds, run the Test Cartridge & Media diagnostic (see “Resolving Media-Related Problems” on page 200). 2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, clean the failing drive and run the drive diagnostics (see “Clean Drive” on page 151 and “Resolving Media-Related Problems” on page 200). If the drive diagnostics run successfully, perform the operation that produced the initial drive error. 3. If the problem persists, replace the drive. <p>If it is not possible to run the tape cartridge in a different drive, perform the following procedures:</p> <ol style="list-style-type: none"> 1. Clean the failing drive and run the drive diagnostics (see “Clean Drive” on page 151 and “Resolving Media-Related Problems” on page 200). If the drive diagnostics run successfully, run the Test Cartridge & Media diagnostic (see “Resolving Media-Related Problems” on page 200). 2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, perform the operation that produced the initial drive error. 3. If the problem persists, replace the drive.
B	No error or message is assigned. See error code 8 in this table.
C	<p>The tape drive needs to be cleaned. Clean the tape drive. See “Clean Drive” on page 151.</p> <p>The error code clears when you clean the tape drive or place it in maintenance mode.</p>
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 “Fibre Channel Addressing” on page 40.
D	No error or message assigned. See error code 0 in this table.
E	<p>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.</p> <p>The drive is placed online when it receives the Online command from the Fibre Channel interface.</p> <p>After a reset, the drive comes online.</p>
F	<p>The tape drive determined that no light is being received over the Fibre Channel. See “Fixing Fibre Channel Errors” on page 252.</p> <p>The error code clears when the drive detects light or when you place the drive in maintenance mode.</p>

Resolving Media-Related Problems

- Test Cartridge & Media diagnostic that verifies whether a suspect cartridge and its magnetic cartridge are acceptable for use.
- A Statistical Analysis and Reporting System (SARS) assists in isolating failures between media and hardware. To determine the cause of failure, SARS uses the cartridge performance history that is saved in the cartridge memory (CM) and the drive performance history that is kept in the drive's flash erasable programmable read-only memory (EPROM). Any failures that SARS detects are reported as TapeAlert flags on the host.

Attention: If you insert the IBM LTO Ultrium Data Cartridge into another manufacturer's tape drive, the SARS data in the cartridge memory may become lost or invalid.



If you encounter a media-related problem, use the following procedure:

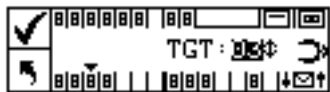
Attention: When you run the Test Cartridge & Media diagnostic, data on the suspect cartridge is overwritten. Similarly, use only a scratch data cartridge when you run tape drive diagnostics; the test overwrites data on the cartridge.






1. If possible, run the cartridge in a different tape drive. If the operation in the other tape drive fails and **6** or **7** displays, replace the media. If the operation succeeds, run the Media Read/Write diagnostic (see "Drive Maintenance Test" on page 155).
2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, clean the tape drive and run the Normal Read/Write diagnostic (see "Drive Maintenance Test" on page 155).
3. If the tape drive diagnostics fail, replace the tape drive sled, see "Removing the Drive from the Drive Sled" on page 298. If the tape drive diagnostics run successfully, perform the operation that produced the initial media error.

Manual Removal of Tapes

You can remove a cartridge manually from a drive, the rear slots, the front magazines, and the picker. You can position the picker to move it out of your way to be able to reach the back interior of your library. You can also position the picker when you want to remove a cartridge from the picker. Follow the procedure below to position the picker.

1. From the Tools menu, highlight  and press .



2. Press  and  to select the target slot in which to move the picker.
3. Press  to highlight  and then press .

Manual Removal of a Tape from a Drive

For Ultrium 3 drives only. Before attempting to remove a tape from the drive, it is *very important* to preserve the active dump information in non-volatile storage in case the drive has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:








Path: Main Menu → Tools Menu → Drive Maint → Prsrv Dump

For procedure instructions, see 156.

If a cartridge fails to eject from the library, you can perform the following steps to reset the drive and eject the cartridge.

1. Vary the library and drives offline to *all* attached hosts.
2. Remove the right-hand cartridge magazine.

Note: Ensure that you do not interchange magazines if you remove both.

3. Locate the drive that contains the stuck cartridge. If the picker is in front of the drive, use the Operator Panel to move the picker to target position 1 (Main Menu → Tools Menu → Position Picker). See “Position Picker” on page 160.
4. Carefully reach through the magazine slot, then press and release the eject button  (see Figure 79 on page 202) on the front of the drive and wait for approximately two 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 eject button  (see Figure 79 on page 202) for at least 10 seconds. The single character display  (see Figure 79 on page 202) should change as the drive performs a power-on self test (POST). If this does not happen cycle power to the library (turn it off, then on again).
6. After a reset or power cycle, the drive should start a slow rewind. During the slow rewind the activity LED  (see Figure 79 on page 202) will be flashing. You must wait for the LED to stop flashing, indicating that the slow rewind is complete. **This process may take up to 20 minutes.**
7. Press and release the eject button  (see Figure 79 on page 202) on the front of the drive and wait for approximately two minutes. If the cartridge ejects the procedure was successful.

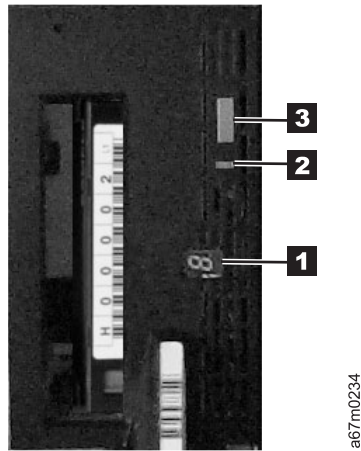


Figure 79. Resetting the Tape Drive

8. If the cartridge will not eject from the drive, see “Contacting IBM Technical Support” on page 205.

Manual Removal of a Tape from a Rear Slot

To manually remove a cartridge from one of the rear slots, use the following steps:

1. Position the picker to the far right. See “Manual Removal of Tapes” on page 201.
2. Power off the library.
3. Open the front door and remove the two magazines.

Note: Ensure that you do not interchange magazines when the magazines are placed back in the library.

4. Reach into the back of the library and press up on the green lever to release a cartridge from the rear slot.
5. Gently pull the cartridge out toward you.

Manual Removal of a Tape from the Picker

To manually remove a cartridge from the picker, use the following steps:

1. Position the picker to be accessible to you. See “Manual Removal of Tapes” on page 201.
2. Power off the library.
3. Open the front door and remove the two magazines.

Note: Ensure that you do not interchange magazines when the magazines are placed back in the library.

4. If the cartridge is toward you, grasp it and remove it gently. However, if the cartridge is away from you, gently push it into a rear slot with a long narrow object such as a ruler.

Note: If a cartridge is partially in the drive and partially in the picker, contact support for removal instructions. See “Contacting IBM Technical Support” on page 205.

RMU Analysis Procedure

If the RMU is not functioning at all or if it is intermittently functioning, review the following steps to ensure that it is properly configured, or, to help determine which part needs to be replaced. The complete RMU electronics and microcode resides on the RMU attachment plugged into the rear of the base unit.

1. Ensure that the RMU attachment is securely plugged and fastened to the RMU connector in the rear of the library.
2. Refer to Appendix G, "3582 Configuration Form," on page 307 and ensure that the correct IP, Subnet Mask, and gateway addresses are keyed into the network parameters.

Path: Main Menu→SetupMenu→RMU

3. Ensure that the correct IP address is being used on the web browser.
4. If the ethernet connection is a direct connection between the PC and the library, ensure that a special "crossover" ethernet cable is being used. Otherwise, if the library connection is made to a network hub or switch, ensure that a normal "straight-through" ethernet cable is being used.
5. Refer to Figure 80. When the library power is switched ON, LED **2** will cycle from RED to AMBER to GREEN during the Power On Self Test (POST) and library initialization.
 - If LED **2** remains RED or AMBER after the library initialization is complete, replace the RMU.
 - If LED **2** is OFF after the library initialization is complete, replace the RMU first. If that does not solve the problem, replace the base unit.

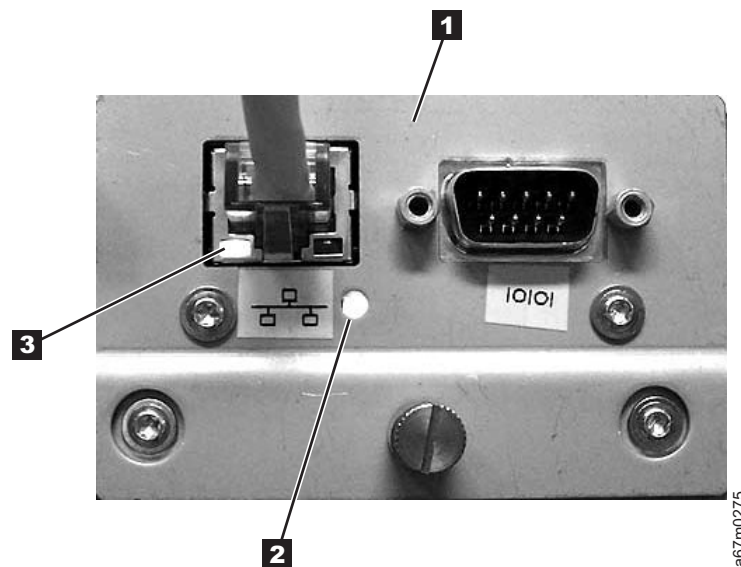


Figure 80. RMU

6. LED **3** should be GREEN any time library power is ON and the ethernet (RJ45) cable is connected at both ends.
 - If LED **3** is not GREEN with power ON, check the ethernet cable carefully (or try another cable) and, if the RMU is connected to a network hub or switch, try another port. The problem may be with the hub, switch, ethernet adapter or network interconnectability.
 - If LED **3** is GREEN, but you still have a problem, suspect the cabling, ethernet adapter, or server (Host). Contact your IBM Technical Support Center for assistance, if necessary.

Bar Code Scanner Analysis Procedure

If you are experiencing problems with the bar code scanner, run the procedure below.

1. Ensure that the bar code scanner has been configured properly. The bar code scanner must be configured for the Extended mode. See “Configure Bar Code Scanner” on page 120.
2. Ensure that you are using supported bar code labels. See Chapter 7, “Ultrium Media,” on page 163.
3. If bar code scanner problem is isolated to a single cartridge or to particular cartridges, check for damaged labels.
4. Clean the lens of the bar code scanner. See “Cleaning the Bar Code Scanner.”

Cleaning the Bar Code Scanner

If the bar code scanner is unable to read a bar code label, the window on the scanner may need to be cleaned. Refer to Figure 81 for instructions on how to unscrew the bar code scanner. Refer to Figure 82 on page 205 for instructions on how to remove the bar code scanner for cleaning. After removing the bar code scanner for cleaning, wipe the bar code scanner window with a lint-free cloth and replace the bar code scanner by screwing it back into the library.

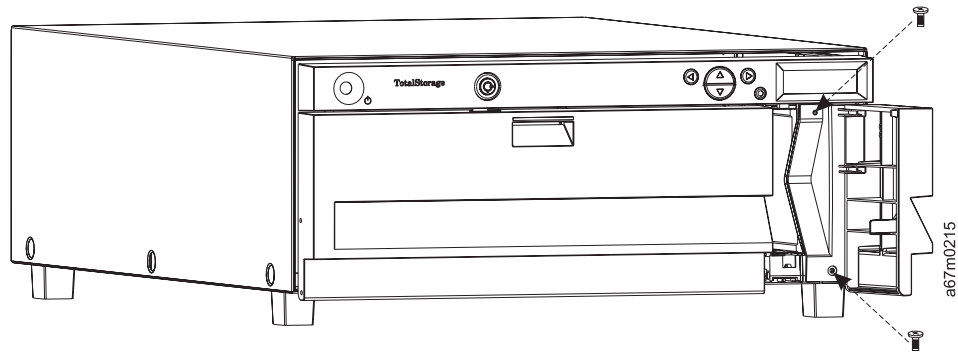


Figure 81. Unscrewing the bar code scanner

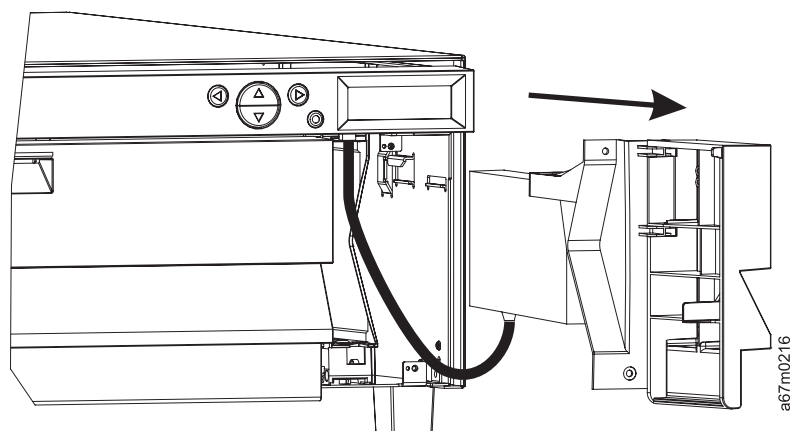


Figure 82. Removing the bar code scanner

After connecting the bar code scanner cable (**1** in Figure 83), route the excess cable using an "S" loop and hold the cable as shown in Figure 83 while sliding the bar code scanner assembly into the library.

Note: Remove the right magazine for a better view of the cable.

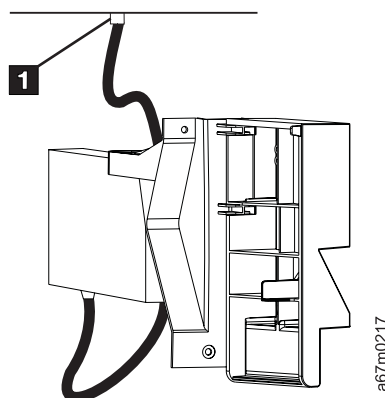


Figure 83. Routing the Bar Code Scanner Cable

Contacting IBM Technical Support

Prior to calling IBM Service, the customer is responsible for following IBM's published LTO diagnostic procedures including any needed update to the latest level of firmware. For details, refer to <http://www.ibm.com/storage/lto>.

The IBM support center will assist with problem determination and initiate shipment of a replacement part, if needed, to the customer's location. Transportation costs, both ways, are paid by IBM. The replacement part becomes the property of the customer in exchange for the failed part, which becomes the property of IBM. The customer must transfer the machine type, model, and serial number of the failing unit to the replacement unit. A Failure Analysis form is also included. The customer is responsible for packing the failed part into the shipping carton that contained the replacement part. The customer is responsible for contacting IBM to arrange for its collection in most major cities outside of Peoples' Republic of China (PRC). Failure to return the failed part to IBM within 30 days will result in the customer being billed for the new list price. The customer is

responsible for installing and setting up the replacement part. For PRC, the customers are required to bring the failed part to the nearest IBM authorized service center to obtain the replacement part.

Failure to use the carton in which the replacement part was received, or failure to otherwise properly pack the returned part, could result in charges being incurred by the customer for damage to the failed part during shipment. Failure to fill out and affix the identification tag to the replacement unit with the machine type, model, and serial number of the failing unit could result in losing the warranty for the replacement unit.

Before calling support, follow these steps which will help you take full advantage of your call:

- Review all documentation carefully. (Experience has demonstrated that most questions are answered in your documentation.)
- Be prepared to explain whether the software or hardware has worked properly at anytime in the past. Have you changed anything recently?
- Pinpoint the exact location of your problem, if possible. Note the steps that led to the problem. Can you duplicate the problem or is it a one-time occurrence?
- Note any error messages displayed on your PC monitor or file server. Write down the exact error message.
- If at all possible, call while at your computer, with the library installed and turned on.
- If running on a network, have all relevant information available (that is, type, version number, network hardware, and so on).
- Be prepared to provide:
 - Your name and your company's name
 - Model number
 - Serial number of the library (front cover, lower right corner)
 - Software version numbers
 - Device driver information
 - Host application name and version
 - Hardware configuration, including firmware versions, date, and number
 - Type of host, operating system version, clock speed, RAM, network type, network version, and any special boards installed
 - A brief description of the problem

Having this information available when you call for customer assistance will enable support personnel to resolve your problem in the most efficient manner possible.

Chapter 9. Removal and Replacement Procedures

Attention

Before removing and replacing parts, download the latest level of firmware by visiting the above website and clicking on Technical Support or LTO Support. Your failing part may function as designed after you install the latest level of firmware.

Before removing or replacing the library and the bar code reader, perform the following general service procedures.

- Use Chapter 8, “Troubleshooting and Diagnostics,” on page 187 to isolate where the failure is occurring. There are several possible locations:
 - Tape drive and robotics
 - Media
 - SCSI cables and terminator
 - Server hardware
 - Application software
- Prior to cycling power to the library:
 - Write down the error message or error code that appears on the message display.
 - If possible, and especially if the problem appears to be related to the tape drive, copy the existing microcode dump in the drive’s memory. For information about using IBM’s utility programs to obtain drive dumps, see the *IBM Ultrium Device Drivers Installation and User’s Guide*.
 - **For Ultrium 3 drives only.** If the tape drive is going to be replaced, it is *very important* to preserve the active dump information in non-volatile storage **before** switching the library power OFF. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:



Path: Main Menu —> Tools Menu —> Drive Maint

For procedure instructions, see 156.

For a list of parts for the library, see Chapter 10, “Parts List,” on page 235.

Removing/Replacing a Drive

Use the instructions in this section to remove or install a drive to your library.

Removing a Drive

For Ultrium 3 drives only. Before removing the tape drive, it is *very important* to preserve the active dump information in non-volatile storage **before** switching the library power OFF. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:



Path: Main Menu → Tools Menu → Drive Maint → Presv Dump

For procedure instructions, see 156.

- ___ 1. If the drive to be replaced has a cartridge mounted, use the drive dismount command to remove the cartridge.



Path: Main Menu → Command Menu → Dismount Drv

If the cartridge is stuck in the drive, refer to “Manual Removal of a Tape from a Drive” on page 201 to attempt removal. If this process fails, leave the cartridge in the drive, and continue with the drive removal steps below.

- ___ 2. Use the library’s Operator Panel to access the SCSI ID or Fibre Channel Loop ID of the broken drive. See “Display Serial Number” on page 148. Verify that the correct serial number is recorded on the Appendix G, “3582 Configuration Form.” If you are unable to record these IDs, contact the administrator who recorded this information during the library’s installation.
- ___ 3. Disconnect the SCSI or fibre interface cable. For SCSI drives, disconnect the second SCSI cable or remove the SCSI terminator.
- ___ 4. Loosen the drive’s thumbscrews.
- ___ 5. Pull the drive module out.

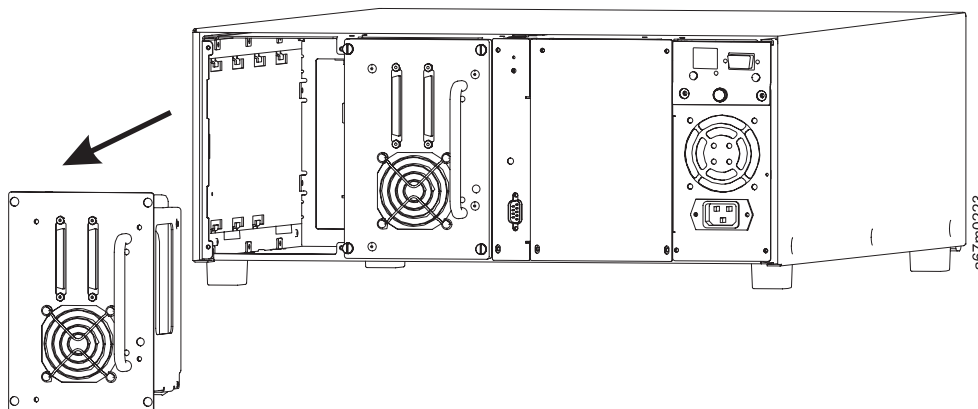


Figure 84. Removing a Drive

Replacing a Drive

Your library comes with either one or two drives.

Note: This procedure applies for both SCSI and Fibre Channel drives. SCSI drives are shown in Figure 85 and Figure 86.

Note: A drive must always be present in the first slot (shown on the right in Figure 85).

- ___ 1. Remove the drive module from the packaging.
- ___ 2. From the rear of the library, locate the drive slot from which you removed the failing drive. If necessary, remove the cover plate **1**.

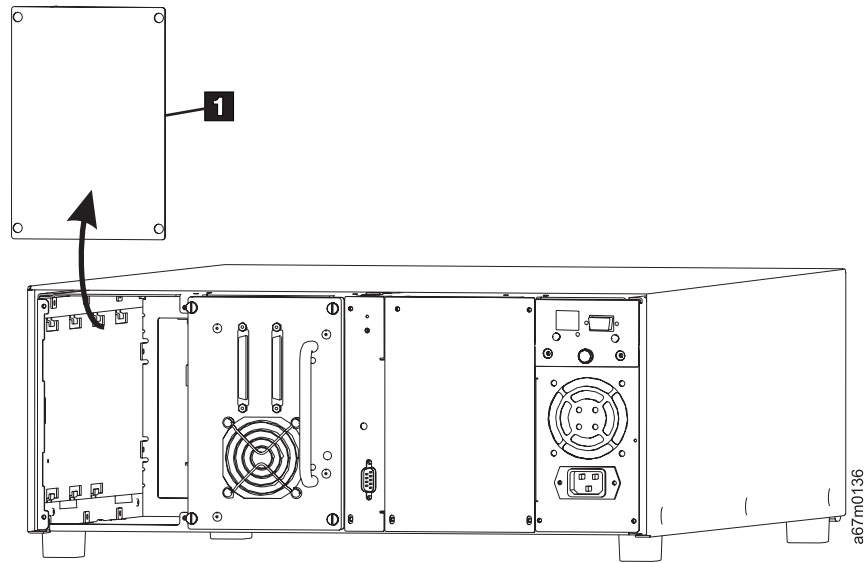


Figure 85. Drive module cover plate removal

- ___ 3. Slide the drive module into position, being careful to ensure that the metal edge on the drive module is inserted into the plastic guides, top and bottom on the left side of the drive bay. If the right side of the drive interferes with the right-fixed edge, withdraw the drive completely and realign it so that the edge guides align with the slots.

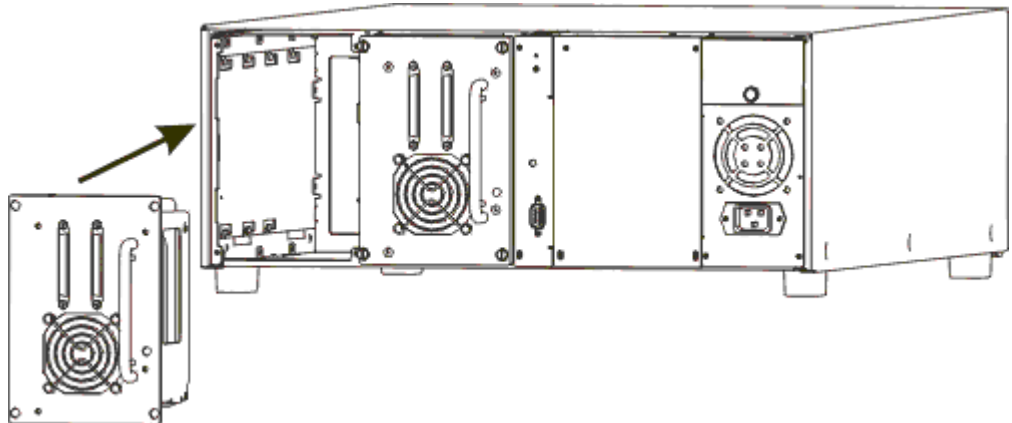


Figure 86. Drive module installation

- ___ 4. Tighten the four thumbscrews by tightening each thumbscrew at the same pace as every other thumbscrew. Do not fully tighten a thumbscrew before starting the other three thumbscrews. Make sure the rear plate is flush with the chassis and all screws are fully tightened.
- ___ 5. Connect the appropriate cable (SCSI and/or Fibre Channel) to the drive sled connector.
- ___ 6. If you are connecting SCSI drives, connect the second SCSI cable or SCSI terminator.
- ___ 7. Verify the new drive has the original ID (see “SCSI and Fibre Channel Loop ID Settings” on page 108).

For information on setting up a specific SCSI address for the new drive, see “SCSI and Fibre Channel Loop ID Settings” on page 108. For information on setting up a specific Fibre Loop ID for the new drive, see “Fibre Setup” on page 111.

Removing/Replacing a Bar Code Scanner



Class I

CAUTION:

This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)



CAUTION:

This assembly contains mechanical moving parts. Use care when servicing this assembly. (C025)

Removing a Bar Code Scanner

Tools Required: #1 Phillips

- ___ 1. Power down the library.
- ___ 2. On the rear of the library, disconnect the AC line cord from the library.
- ___ 3. On the front of the library, open the Input/Output (I/O) door, which is located to the right of the media access door.
- ___ 4. Remove the top and bottom screws on the bracket inside the I/O door. Save the screws. You will need them to re-install the door.

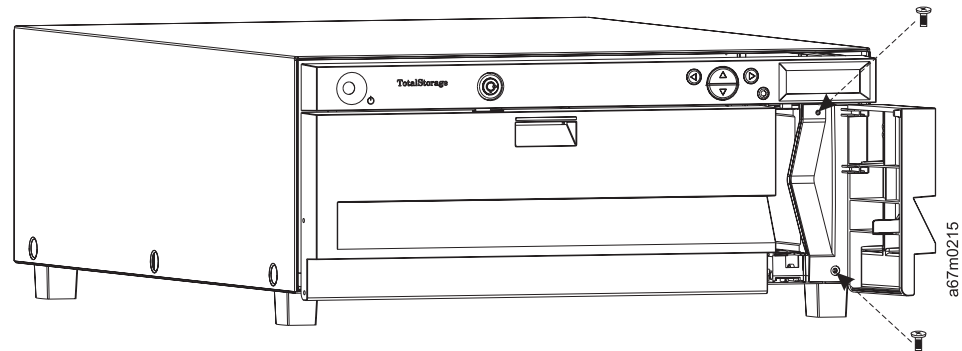


Figure 87. Unscrewing the I/O Door

- ___ 5. Pull the door straight out to partially remove the door and bracket.

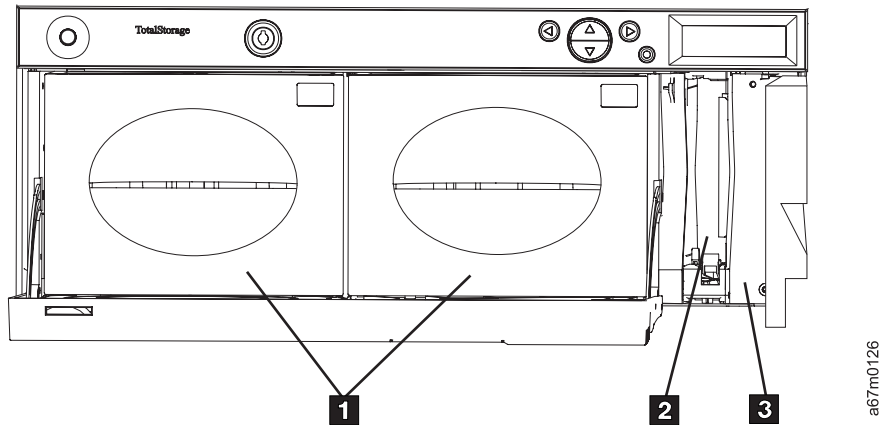


Figure 88. Removing the I/O Door

Note: You may need to pull firmly to remove the door. Do not pull the door out too far because the bar code scanner is still connected to the library.

- 6. Disconnect the bar code scanner cable connector from inside the library by pressing on the tab on the connector.

Note: The cable is plugged into the rear receptacle.

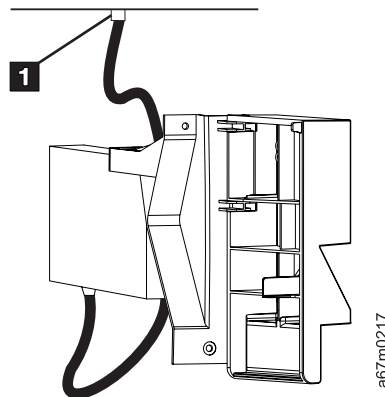


Figure 89. Disconnecting the Bar Code Scanner Cable

- 7. Remove the existing bar code scanner by loosening the two screws on the top of the I/O door bracket (see Figure 90) and detaching the scanner from the bracket.

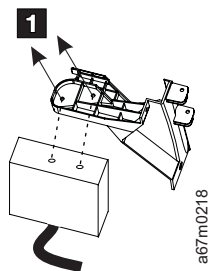


Figure 90. Removing the Bar Code Scanner

Replacing a Bar Code Scanner

Once you have removed the existing bar code scanner, follow the instructions below to install a new bar code scanner. Once the bar code scanner is installed, you must activate it through the **Setup** menu on the LCD. For more information, see “Verifying Bar Code Scanner Activation” on page 215.

Tools Required: #1 Phillips

- ___ 1. Remove the bar code scanner from its packaging.
- ___ 2. Align the two screw holes on the top of the bar code scanner with the screw holes on the I/O door bracket.

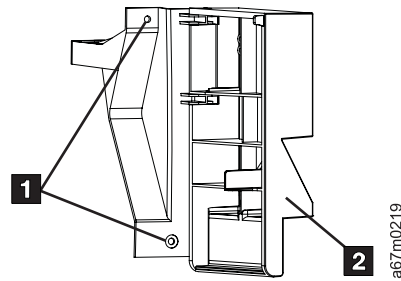


Figure 91. Aligning the Bar Code Scanner

- ___ 3. Attach the bar code scanner to the bracket using the two screws that came with the bar code scanner. See Figure 92.

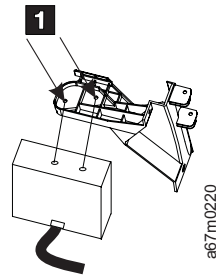


Figure 92. Attaching the Bar Code Scanner

- ___ 4. Wipe the bar code scanner lens with a lint free cloth to ensure no fingerprints or dust are left on the lens.
- ___ 5. Locate the two receptacles inside the library underneath the LCD screen. Insert the connector on the bar code scanner into the **rear** receptacle as shown in Figure 93 on page 214.

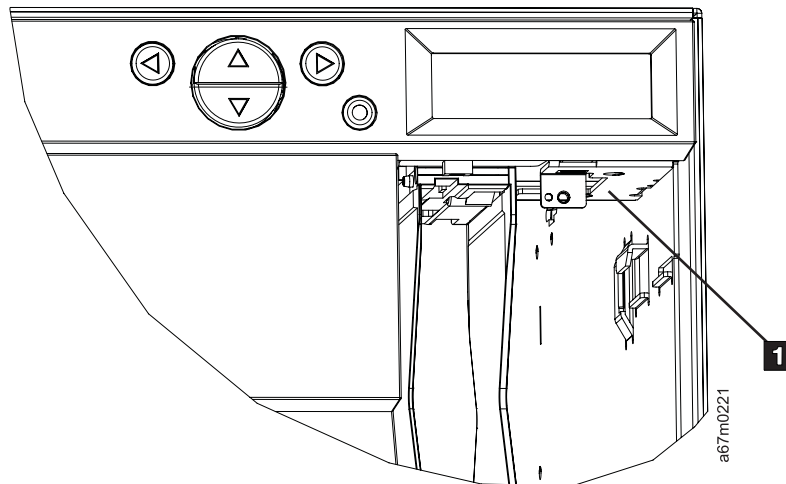


Figure 93. Connecting the Bar Code Scanner

- 6. Before sliding the assembly back into the library, route the excess cable using an "S" loop behind the bar code scanner as shown in Figure 94. This step is very important because it prevents the excess cable loop from sliding along the right edge of the chassis into the path of the picker mechanism.

Note: Remove the right magazine for a better view of the cable.

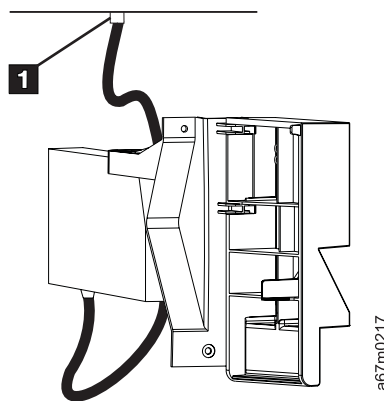


Figure 94. Routing the Excess Bar Code Cable Loop

- 7. Slide the plastic tab on the right side of the I/O door bracket (see Figure 95 on page 215) into the metal guide inside the library.

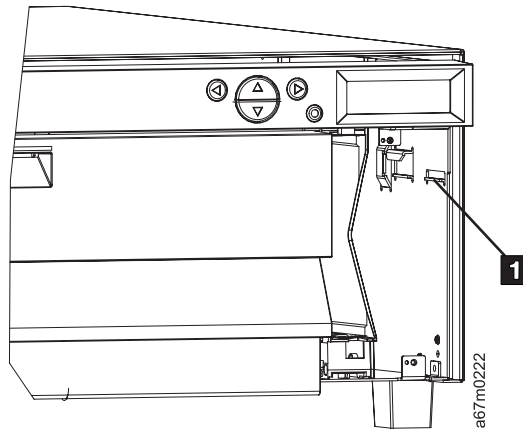


Figure 95. Bar Code Scanner Guide




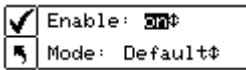



- ___ 8. Reattach the I/O door/bar code scanner assembly to the library using the two screws you removed from the bracket previously.
- ___ 9. Power on the library.



Verifying Bar Code Scanner Activation

Before you can use your bar code scanner, you must activate it. To verify the configuration of your bar code scanner, follow the procedures. Alternatively, you can also enable the scanner through the Setup Wizard.



Path: Main Menu → Setup Menu → Scanner

Selection	Description/Result
 <p>Step 1 From the Setup menu, select  and press .</p>	Configures the bar code scanner.
 <p>Step 2 Press  or  to enable or disable the bar code scanner.</p>	<p>Available options are:</p> <p>on All media is scanned for bar codes. Unlabeled or unreadable labeled media generates a user message.</p> <p>off Bar code scanner is disabled.</p>
<p>Step 3 Press  to move to the next field.</p>	

Selection	Description/Result
<div> <input checked="" type="checkbox"/> Enable: on <input type="checkbox"/> Mode: Default </div> <p>Step 4 Press ▲ or ▼ to select the Extended scanner mode.</p>	<p>Available options are:</p> <p>Default The scanner expects to read and reports to the host six characters. Optional one- or two-character media identifiers can be present but are not reported.</p> <p>Media ID The scanner expects to read and reports to the host seven or eight characters (six plus the media identifier).</p> <p>Extended The scanner reads and reports to the host between five and sixteen characters.</p>
<div> <input checked="" type="checkbox"/> Enable: on <input type="checkbox"/> Mode: Extended </div> <p>Step 5 Press ► to highlight <input checked="" type="checkbox"/> and then press .</p>	<p>Your bar code scanner is configured and ready for use.</p>
<div> <input checked="" type="checkbox"/> Set Scanner <input type="checkbox"/> Complete. </div> <p>Step 6 A confirmation screen is displayed. Press  to dismiss.</p>	

Removing/Replacing an RMU

The Remote Management Unit (RMU) allows you to access your library via a web browser. Follow the procedures below to install or remove the RMU.

Removing an RMU

- ___ 1. Record the IP address, subnet mask, and gateway address on the Appendix G, "3582 Configuration Form." If you are unable to retrieve this information from the machine, request this information from your administrator.
- ___ 2. Power down the library.
- ___ 3. On the rear of the library, disconnect the AC line cord from the library.
- ___ 4. Disconnect the network cable from the RMU.
- ___ 5. Remove the RMU by loosening the thumbscrew and pulling out the RMU.
- ___ 6. If you are not replacing this RMU, reinstall the cover plate you removed when you initially installed the RMU. The cover plate is required for proper operation and cooling of the library if you remove the RMU.

Replacing an RMU

The remote management unit (RMU) allows you to access your library through a Web browser.

- ___ 1. Remove the RMU from the packaging.
- ___ 2. From the rear of the library, locate the available RMU slot.

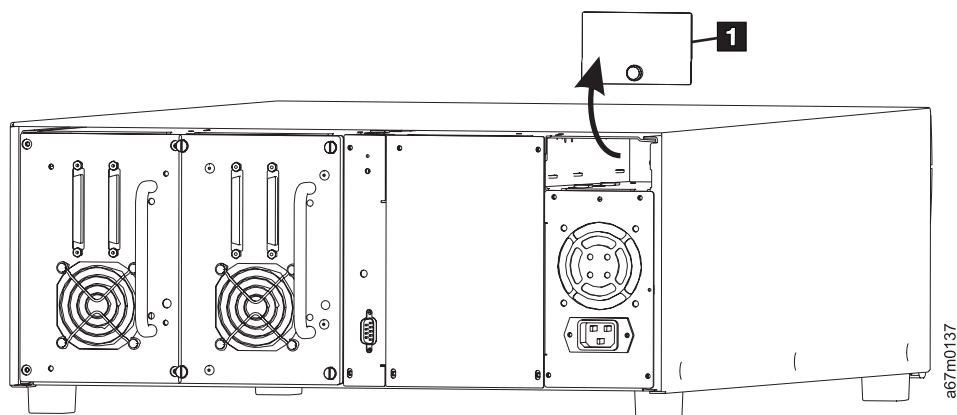


Figure 96. RMU cover plate removal

- ___ 3. Slide the RMU (see **1** in Figure 97 on page 218) into position and tighten the thumbscrew.

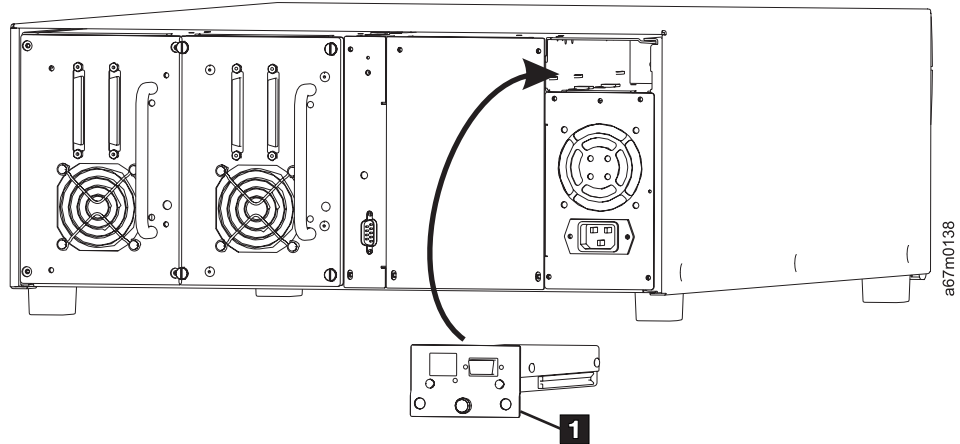


Figure 97. RMU module installation

- ___ 4. Plug the power cord into a grounded electrical socket.
- ___ 5. Power on the library.

The library will detect the presence of the RMU. You will need to set the IP address, subnet mask, and gateway address before the RMU will function. Refer to the Appendix G, "3582 Configuration Form" for this information. You can do this through the "Setup Wizard" on page 75 or "Configure RMU" on page 116.

Removing/Replacing a Base Unit

Preparing to Remove the Base Unit

Before removing the base unit, you must record Vital Product Data (VPD). VPD is stored in two non-volatile locations: on the library's RMU, if installed, and on the main controller in the base unit. The RMU, if installed, will automatically upload the VPD information to your library's main controller upon startup of a new base unit. But if your library does not have a RMU installed, you must either retrieve the VPD from the original base unit or you must retrieve the VPD from the administrator who recorded the library's settings during installation. Even if you have a RMU installed, it is recommended that you record your library's VPD settings on the 3582 Configuration Form, and store the information in a safe location. The 3582 Configuration Form can be found in Appendix G, "3582 Configuration Form," on page 307.

- ___ 1. Record the exact location of each drive in the failing base unit.

Note: Ensure that you place drive 1 into the same location in the replacement base unit.

- ___ 2. Record the exact location of each cartridge in each magazine, and the exact location of each magazine.

Note: Both cartridge magazines (with all cartridges in the original slots within the magazine) and all of the cartridges in the rear slots must be moved to the corresponding magazine locations and rear cartridge slots in the new base unit. See "Base Unit Removal" on page 221 for the recommended procedure to perform this transfer.

Removing the Library from a Rack (Optional)

If your library is installed in a rack, perform this procedure to remove it from the rack, then continue with the procedure in "Base Unit Removal" on page 221.

If your library is not installed in a rack, skip this section and proceed to "Base Unit Removal" on page 221.

- ___ 1. Power OFF the library.
- ___ 2. Unplug the AC power cord and SCSI or fibre interface cables, and note which cables connect to which drives. Also, unplug the ethernet cable from the RMU, if installed.
- ___ 3. Loosen the thumbscrews on the mounting brackets on the front of the library securing it to the rack.
- ___ 4. With assistance from another person, secure the library by placing hands on the top and the bottom of the library and slowly pull it out of the rack.
- ___ 5. After the stop plates installed on the back of the library stop it from being pulled out of the rack, tilt the library up to slide it completely out of the rack.

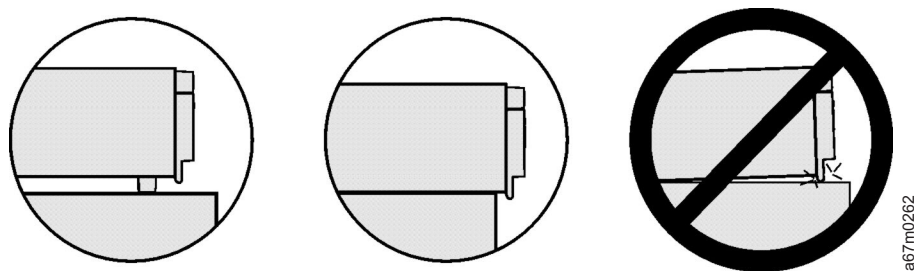


Figure 98. Protecting the front doors of the library from damage

ATTENTION

To avoid damage to the doors on the front of the library, **DO NOT SET THE LIBRARY DOWN ON A FLAT SURFACE WITHOUT FEET INSTALLED.**

- 6. With assistance from another person, turn the library upside down on a sturdy table.
- 7. Remove the two stop plates from the bottom of the base unit. These stop plates will be installed on the replacement base unit later in this procedure.
- 8. Locate the four feet and eight screws that were used to attach the feet to the base unit when it was originally shipped from the factory.
- 9. Using a #1 Phillips screwdriver and two long screws, attach a foot (see **1** in Figure 99) to each corner of the base unit. Be sure the edge of the base unit fits into the notches in the feet.

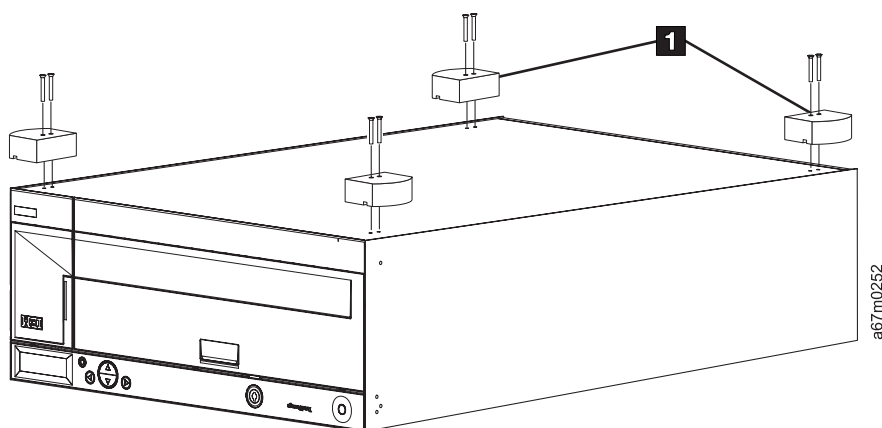


Figure 99. Attachment of Feet

- 10. With assistance from another person, turn the library back over into an upright position.

Note: If you were unable to locate the four feet for the base unit, you can set the unit down on the edge of the table or work surface as shown in the middle illustration of Figure 98.

- 11. Proceed with Step 4 on page 221 of “Base Unit Removal” on page 221.

Base Unit Removal

- ___ 1. Power OFF the library.
- ___ 2. Unplug the AC cord and SCSI or fibre interface cables, and note which cables connect to which drive. Also, unplug the ethernet cable from the RMU, if installed.

ATTENTION

To avoid damage to the doors on the front of the library, DO NOT SET THE LIBRARY DOWN ON A FLAT SURFACE WITHOUT FEET INSTALLED.

- ___ 3. Place the library on a suitable work surface.
- ___ 4. Move the magazines, data cartridges, and cleaning cartridge to the corresponding slots in the new base unit.
Tip: To avoid misplacing magazines or rear slot cartridges, it is recommended to transfer the magazines and rear slot cartridges to the new base unit at this time. Place the new unit beside the original unit on the work surface. Pull the magazines (mark the location from which each was removed), and then transfer the rear slot cartridges, one by one, to the corresponding slot in the new base unit (see “Manual Removal of a Tape from a Rear Slot” on page 202). After the rear slot transfer is complete, insert the magazines (with cartridges) into the corresponding locations in the new base unit.
- ___ 5. Loosen the thumbscrews and remove the drives (see “Removing a Drive” on page 208).

Note: If there is only one drive in the library, be sure to also remove the drive module cover plate from the vacant drive slot.
- ___ 6. Remove the Remote Management Unit by loosening the thumbscrews and pulling out the RMU (see “Removing an RMU” on page 217).

Installing the New Base Unit

- ___ 1. If magazines and cartridges have not already been transferred to the new base unit, transfer each rear cartridge to the corresponding slot in the new base unit, and then transfer each magazine to the corresponding location in the new base unit.
- ___ 2. Install the drives, or drive and cover plate, in their same locations in the new base unit (see “Replacing a Drive” on page 209).
- ___ 3. Install the RMU in the new base unit “Replacing an RMU” on page 217.
- ___ 4. Position the library in its original location. If your library is to be installed in a rack, perform the following:
 - a. With assistance from another person, turn the library upside down on a sturdy table.
 - b. Remove the four feet from the bottom of the library and install the two stop plates that were removed from the old base unit.
 - c. Reinstall the library in the rack.
- ___ 5. Replace the SCSI or fibre interface cables on their original connector locations. Also, plug the ethernet cable into the RMU, if installed.
- ___ 6. Plug the power cord into a grounded electrical outlet.
- ___ 7. Power on the library.

- 8. Reconfigure your library.
 - a. If your library contains an RMU, the library will be configured with data automatically transferred from the RMU. Use the Setup Wizard (see “Setup Wizard” on page 75) to verify that all settings are correct.
 - b. If your library does not contain an RMU, use the Setup Wizard to reconfigure the library. Use the settings recorded on the 3582 Configuration Form, which can be found in Appendix G, “3582 Configuration Form,” on page 307.
- 9. If the control path failover feature is installed, verify that it is still enabled. See the “Set Control Path Failover/Add Control Paths (Access Mode)” section in the *IBM TotalStorage 3582 Tape Library Setup, Operator, and Service Guide* (GA32-0458).



Path: Main Menu —> Setup Menu —> SCSI/FIBRE —> Access Mode

Ensure that both the control path failover and the additional control paths are set correctly.

Note: If control path failover is enabled, the license key for this feature has been successfully transferred from the RMU to the new base unit, even though the new base unit has a different internal serial number.

- 10. Cycle the library power OFF, then ON, to ensure that all of the configuration options have been stored correctly into the new base unit VPD memory.

At the Host

- 1. It may be necessary to re-IPL the host system again or perform a remove/replace device operation to re-establish access to the library.
- 2. If the control path failover feature is installed, it will be necessary to remove/replace the library and drive devices, and then re-establish the primary and alternate pathing choices. See the *IBM Ultrium Device Drivers Installation and User's Guide* (GA32-0430) for details.

Attaching the RID Tag

Note: The replacement base unit will have a new internal serial number, but this will not affect the normal operation of the library. The license key for the control path failover feature will be automatically transferred to the new base unit VPD by the RMU. The product entitlement and warranty are based on the original serial number, which will be recorded on the Repair Identification (RID) tag.

- ___ 1. Locate the Repair Identification (RID) tag (included with the replacement library). See **3** in Figure 100.
- ___ 2. Read the instructions (**2** in Figure 100) for the RID Tag.
- ___ 3. Copy the serial number (**1** in Figure 100) from the original I/O Door removed from your library onto the RID Tag.

Note: If there already was a RID Tag on the door being removed, copy the serial number from the old RID Tag to the new RID Tag.

- ___ 4. Affix the RID tag to the replacement library (near, but not covering, the serial number on the library). See **3** in Figure 100.

- | | | | |
|----------|---|----------|--|
| 1 | Machine type, model number, and serial number | 2 | IBM Repair Identification Tag Instructions |
| 3 | IBM Repair Identification Tag | | |

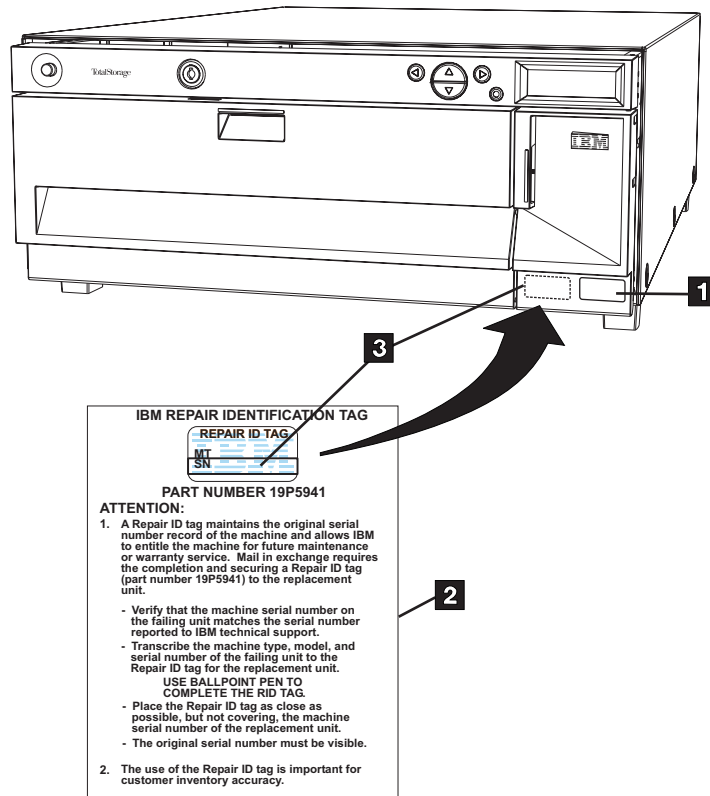


Figure 100. Repair Identification Tag

Replacing the Input/Output (I/O) Door

The sections that follow give information and instructions on installing an I/O Door.

Tools Required: #1 Phillips screw driver

Verify Shipment Contents

✓	Part Number	Description
	24R1144	Input/Output (I/O) Door
		2 screws for attaching the I/O Door
	19P5941	Repair Identification (RID) Tag
	24R1145	Installation Instructions

Removing an I/O Door

- ___ 1. Power down the library.
- ___ 2. On the rear of the library, disconnect the AC line cord from the library.
- ___ 3. On the front of the library, open the Input/Output (I/O) door, which is located to the right of the media access door.
- ___ 4. Unscrew the top and bottom screws on the bracket inside the I/O door. Save the screws. You will need them to reinstall the door.

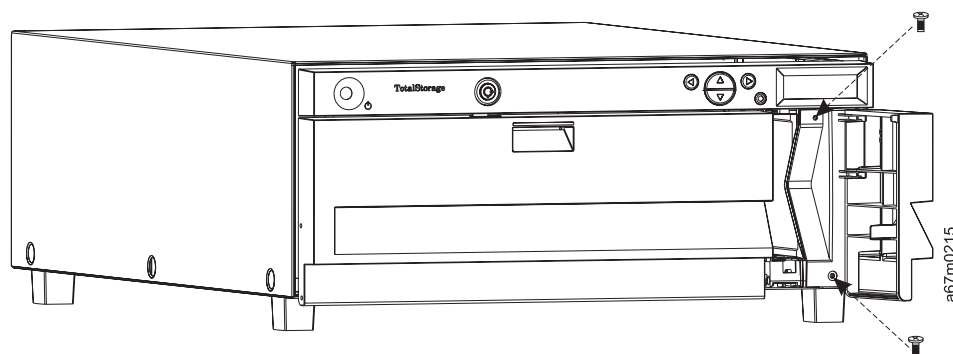


Figure 101. Removing screws from the I/O Door

- ___ 5. Pull the door straight out to partially remove the door and bracket.
Note: You may need to pull firmly to remove the door. Do not pull the door out too far because the bar code scanner is still connected to the library.
- ___ 6. Disconnect the bar code scanner cable connector (**1** in Figure 102 on page 225) from the rear receptacle inside the library by pressing on the tab on the connector.

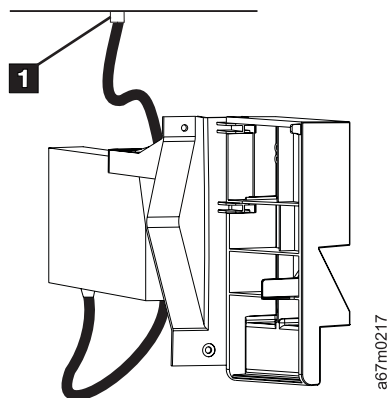


Figure 102. Disconnecting the Bar Code Scanner Cable

- ___ 7. Remove the existing bar code scanner by loosening the two screws (**1** in Figure 103) on the top of the I/O door bracket and detaching the scanner from the bracket. **Save these screws for reinstalling the bar code scanner.**

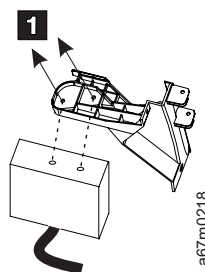


Figure 103. Removing the Bar Code Scanner

Replacing an I/O Door

After you have removed the existing I/O door, follow the instructions below to reinstall the bar code scanner and install the new door. Once the new door is installed, you must activate the bar code scanner through the **Setup** menu on the LCD. For more information, see “Verifying Bar Code Scanner Activation” on page 228.

- ___ 1. Remove the new door from its packaging.
- ___ 2. Align the two screw holes on the top of the bar code scanner (**1** in Figure 104) with the screw holes on the I/O door bracket.

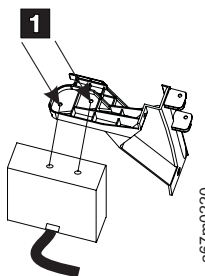


Figure 104. Aligning and attaching the Bar Code Scanner

- ___ 3. Attach the bar code scanner to the bracket using the two screws that were saved when removing the bar code scanner. See Figure 104.

- ___ 4. Locate the two receptacles (**1** in Figure 105) inside the library underneath the LCD screen. Insert the connector on the bar code scanner into the **rear** receptacle.

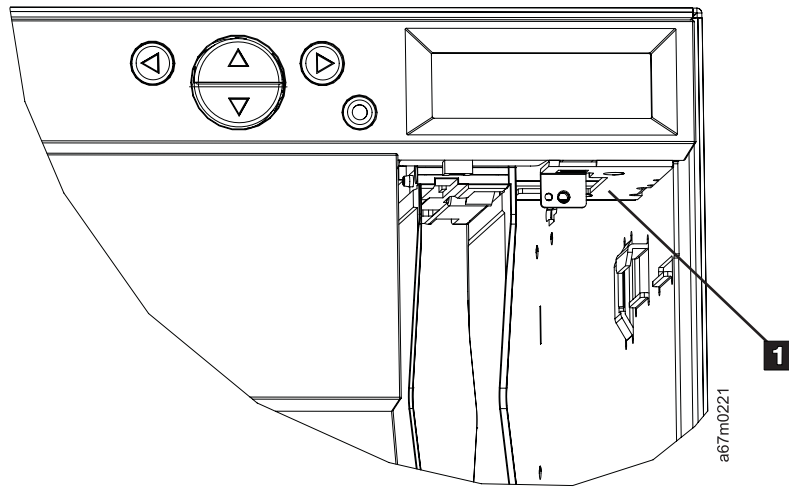


Figure 105. Connecting the Bar Code Scanner cable

- ___ 5. After connecting the bar code scanner cable (**1** in Figure 106), route the excess cable using an "S" loop and hold the cable as shown in Figure 106 while sliding the bar code scanner assembly into the library.

Note: Remove the right magazine for a better view of the cable.

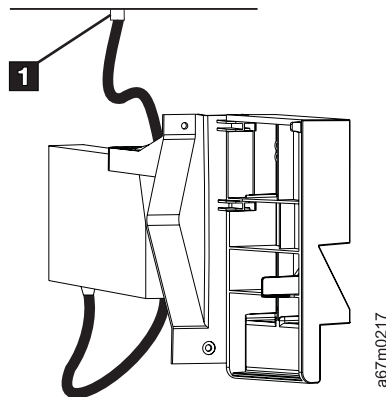


Figure 106. Routing the Bar Code Scanner Cable

- ___ 6. Slide the plastic tab on the right side of the I/O door bracket (see Figure 107 on page 227) into the metal guide (**1**) inside the library while ensuring the cable stays routed as shown in Figure 107 on page 227.

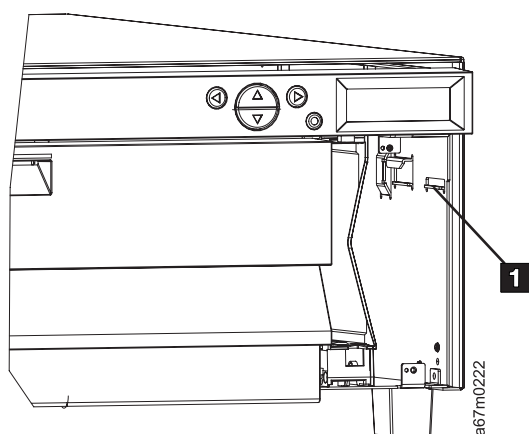


Figure 107. Bar Code Scanner Guide

- ___ 7. Reattach the I/O door and Bar Code Scanner assembly to the library using the two screws you removed from the bracket in Step 4 in “Removing a Bar Code Scanner” on page 211 or use the screws provided in your shipment.

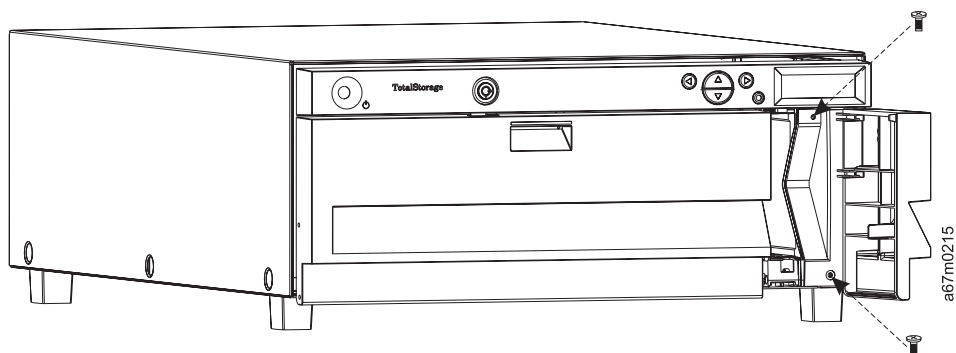


Figure 108. Replacing screws from the I/O Door

- ___ 8. Power on the library.

Attaching the Repair Identification (RID) Tag

A RID Tag maintains the original serial number record of your library and allows IBM to entitle the machine for future warranty service.

- 1. Locate the Repair Identification (RID) Tag included with the new I/O door.
See **3** in Figure 109.
- 2. Read the instructions (**2** in Figure 109) for the RID Tag.
- 3. Copy the serial number (**1** in Figure 109) from the original I/O Door removed from your library onto the RID Tag.

Note: If there already was a RID Tag on the door being removed, copy the serial number from the old RID Tag to the new RID Tag.

- 4. Affix the RID Tag to the replacement I/O Door (**3** in Figure 109) installed on your library.

- | | | | |
|----------|---|----------|--|
| 1 | Machine type, model number, and serial number | 2 | IBM Repair Identification Tag Instructions |
| 3 | IBM Repair Identification Tag | | |

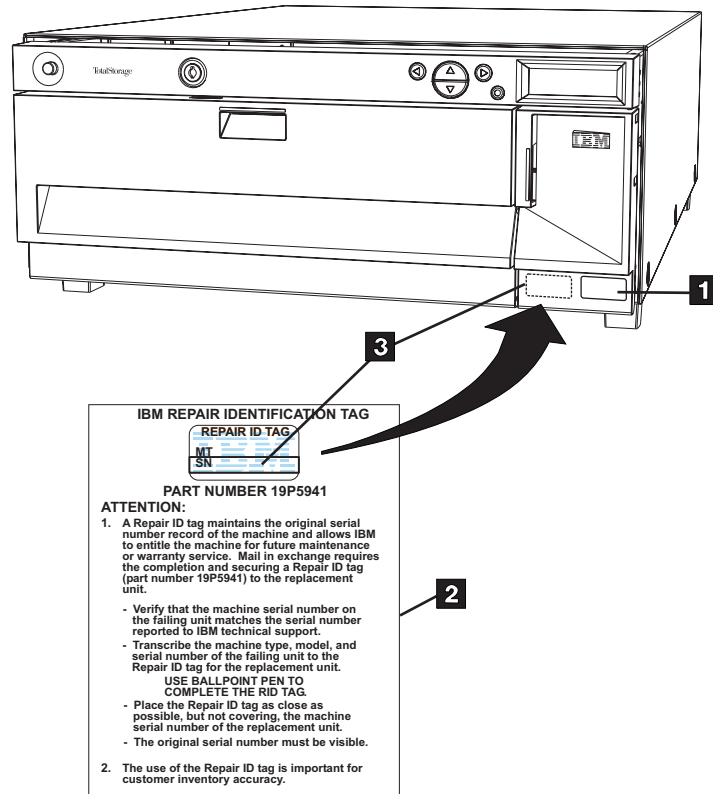


Figure 109. Repair Identification Tag

Verifying Bar Code Scanner Activation

Before you can use your bar code scanner, you must activate it. To verify the configuration of your bar code scanner, refer to “Verifying Bar Code Scanner Activation” on page 215..

Firmware Upgrades

Attention: To ensure optimum performance from the library, use the latest level of firmware. It is the customer's responsibility to obtain and install all firmware.

Note: Before updating firmware on the drives, the library, or the RMU, use your server/application to set the library and drives OFFLINE for all attached servers.

You can update firmware for the drives, the library, or the RMU by using the following methods:

- RMU
- SCSI bus
- FMR cartridge (drive firmware only)
- Library serial port (library firmware only)

Note: When updating RMU and library firmware, it is recommended to update the RMU firmware before updating library firmware.

Table 17. Firmware Download Times by Method

Method	Library Firmware	Drive Firmware Per Drive
RMU	20 minutes	1 hour 40 minutes
SCSI	approx. 50 minutes	2 minutes*
FMR cartridge	N/A	approx. 5 minutes
Library Serial Port	approx. 10 minutes**	N/A
Notes: 1. N/A = not applicable. 2. * For upgrading drive firmware, SCSI is recommended. 3. ** For upgrading library firmware, serial port is recommended.		

To upgrade firmware using the RMU, refer to "Upgrading Firmware Using the RMU" on page 30. To upgrade firmware using an FMR cartridge through the Operator Panel, refer to "Display Firmware Version" on page 141 and "Load Firmware" on page 152. To upgrade firmware using the SCSI bus, refer to "Updating Library and Drive Firmware Using the SCSI/Fibre Bus" on page 230. To upgrade firmware using the serial port, refer to "Updating Library Firmware Using the Library's Serial Port" on page 233. For information on connecting through a serial port, refer to Appendix E, "Connecting to the Serial Port," on page 275.

Updating Library and Drive Firmware Using the SCSI/Fibre Bus

You can update library and drive firmware over your server's SCSI bus 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 (ITDT, LTO-TDX, NTUTIL, or TAPEUTIL)

To obtain the new firmware, download it from the web to the server by visiting <http://www.ibm.com/storage/lto>. 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) cartridge from that drive (see "Creating or Erasing an FMR Tape for Drive Firmware" on page 234).

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>.

To obtain instructions about using NTUTIL or TAPEUTIL, visit the web at <http://www.ibm.com/storage/lto>.

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*.

ITDT SCSI Firmware Update, Dump Retrieval, and Library/Drive Test Tool

Attention

At the time of publication, the ITDT tool was not available. Register with MySupport (<http://www.ibm.com/support/mySupport>) to be notified by email when the tool becomes available, or periodically check the IBM support site (<http://www.ibm.com/storage/lto>) .

The ITDT tool offers multiple functional capabilities that simplify the task of updating tape and library firmware. It is available for most major platforms (Windows, AIX, Sun, Linux, Netware, and so on), and requires no special device drivers. This tool is similar to the LTO-TDX *drive-only* firmware update and dump retrieval tool described later in this chapter.

Note: The ITDT tool is available on the IBM website <http://www.ibm.com/storage/support/lto>. In addition to the executable file (.exe), a README file will be posted on the web page. The README file

describes the features and capabilities of the ITDT tool, provides downloading instructions, and gives detailed information on how to use the tool.

You use the ITDT tool to perform the following tasks:

- Update firmware using SCSI to all IBM LTO Tape Drive and Tape Library products (non-IBM devices may not be selected).
- Upload drive and library dump files
- Perform drive and library diagnostics, including drive read/write diagnostics

The ITDT tool is a command line utility. To invoke it, enter the executable *itdt* from the directory where the tool is located. The Help feature gives a brief explanation of each function and shows the required syntax.

LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool

The LTO-TDX tool is an alternative method for downloading LTO drive firmware across the SCSI bus or fibre channel. In addition, this tool can be used to upload LTO drive error dumps. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO Generation 1, Generation 2, and Generation 3 SCSI and FC drives. The tool will not support any other manufacturer's LTO drive. The tool is available for three different operating systems:
 - **LTO-TDX_WinTool** (for Windows operating systems)
 - **LTO-TDX_NWTool** (for Netware operating systems)
 - **LTO-TDX_LxTool** (for Linux operating systems)
2. The tool can perform two functions:
 - a. Download firmware to the drive
 - b. Upload a dump of the drive firmware logs from the drive to a computer system
3. The tool is distributed from the IBM web site. Download the tool by visiting <http://www.ibm.com/storage/lto/>. The install package or an executable file will be placed on the host system in a location chosen by the user.
4. When the user opens the install package, he will be presented with a license agreement that he must accept to proceed with the install. The user will also be presented with a license anytime the executable file is copied to another location where the firmware or dump folders do not exist. The tool will detect the missing folders at launch and present the user's license, assuming that this is the first launch of a new copy of the tool. There will also be a function that allows the user to view the license at will when he starts the tool.
5. The Windows install package will create a directory for the tool on the user's hard disk and place the executable file (the tool) in that directory. The install package will also load the file into the Programs Menu accessed via the "Start" button and put an icon on the desktop of the Windows operating system. The install package will perform a similar function on any other operating system that has a similar structure.
6. Selection of the icon on the desktop or selection of the tool from the Program Menu will start the tool and create the "LTO Firmware" and "LTO Dumps" files in the directory with the executable tool file.
7. The user must first put the firmware to be downloaded in the firmware folder.
8. Any dumps created will be put in the **dump** folder.

9. The tool will present a list of the supported devices on the bus. The tool will allow selection of a target device and then perform the download or the dump on the target device.
10. The tool itself is a command line tool but it is menu driven and very simple to use.
11. The program displays are in English.
12. The user is responsible for making sure the drive is not in use when firmware is downloaded or a dump is taken. Any cartridge must be removed from the drive or the firmware download function will not work.
13. If the user does make a mistake, the program will respond with instructive error messages.
14. If no IBM LTO tape drives are on the bus or the drives are in reserve, the tool will inform the user that there are no drives before closing the tool window.

Firmware Download Function:

1. The tool is capable of displaying the current firmware level for any drive on the bus.
2. The tool checks to see if a cartridge is in the drive (cartridge present sensor activated). If a cartridge is present, an error will be posted and the user will be asked to remove the cartridge.
3. The tool downloads code to IBM LTO drives ONLY. The tool will recognize ULT3580-TDX inquiry string devices as well as ULTRIUM-TDX devices. The letter "X" could be 1, 2, or 3.
4. The tool is capable of loading down level (older) code.
5. The program presents the user with a numbered list of firmware files available for selection from the LTO Firmware folder. The user can then select the number of the firmware file for the program to load.
6. After the firmware has been loaded into drive memory the drive automatically reboots. The tool discourages the user from power cycling the drive before the reboot is complete. An "Updating.....Please Wait" message and a progress gauge is displayed until the reboot is complete.
7. A "Wait" message is displayed on the user screen during firmware load.
8. If the program tries to load code and fails with a sense Key 5 and an ASC/ASCQ of 82/83, the following wording is displayed: "Bad Firmware Detected. The firmware is the wrong type for your tape drive or the file is corrupted." Download the file again from the IBM Web site and try the procedure again.

Drive Log Dump Function:

1. When the dump function is executed on a drive, the tool will read the existing dump on the drive, force a dump, then read the forced dump. This will create two dump files.
2. The two dump files created by the dump function will be time stamped with year, month, day, and seconds and contain the drive serial number. The first dump file read has an "A" suffix. The second file produced has a "B" suffix.
3. The Tool will place the files that are created in the "LTO Dumps" folder in the directory with the tool.
4. The tool creates the dump files with a file type of .dmp.

Updating Library Firmware Using the Library's Serial Port

Go to the web at <http://www.ibm.com/storage/1to> (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, `V2.11.001.lif`) and an executable file (`3582dl.exe`). (Ensure that you are using the latest level of the executable file.)

1. Open a command prompt window and change the current directory to the temporary directory where `appcode.exe` was extracted.
2. Connect the serial cable P/N 19P1945 between the PC and the serial port located on the SCSI host interface board.
3. From the command prompt, type the following command and press Enter:

```
3582dl -Cn -Fxxxxx.lif
```

Where:

3582dl	Firmware Download Command
-C	Required characters that precede the Communication Port Number
n	Communication Port Number
-F	Required characters that precede the file name
xxxxxx.lif	File name

Note: For help enter the command:

```
3582dl -h
```

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 by selecting **Main Menu (initial screen) —> Status —> Display F/W**.

Note: Some backup application software packages do not reflect the firmware change until the registry is refreshed by rebooting the server.

Creating or Erasing an FMR Tape for Drive Firmware

Before you can create a field microcode replacement (FMR) cartridge, 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**.

Attention: For this operation, insert only a scratch (blank) data cartridge or a cartridge that may be overwritten. During the test, the drive overwrites the data on the cartridge.






To copy an FMR cartridge from a drive that is already loaded with the new firmware, refer to the steps in this procedure.



Path: Main Menu → Tools Menu → Drive Maint



Figure 110. Drive Maint.

- ___ 1. Verify that the I/O slot is empty.
- ___ 2. From the Main Menu, select Tools, then press .
- ___ 3. From the Tools menu, press  or  to select Drive Maint (see Figure 110) then press .
- ___ 4. The following screen will display. Press .

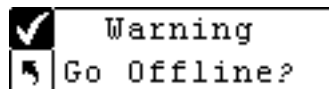












Figure 111. Go Offline?

- ___ 5. Press  or  to select a drive in the next screen.
- ___ 6. Press  to select the POST submenu item.
- ___ 7. Press  or  to scroll to the "Create FMR" or the "Clear FMR" option.
- ___ 8. Press  to select the execute option.
- ___ 9. Press  and the "Insert Test media" prompt will display.
- ___ 10. Open the I/O door and insert a cartridge in the I/O slot.
- ___ 11. Press  to select the execute option.
- ___ 12. Press  and "Warning: Writes Tape" will display.
- ___ 13. Press  to complete the process.
- ___ 14. At the end of the process, a screen will display stating "D1 (or D2) Create FMR Run Time x:xx".

Chapter 10. Parts List

Table 18 lists orderable models and features, as well as customer replaceable units (CRUs) for the 3582 Tape Library. To order a part by feature code, contact your local IBM Marketing Representative or Business Partner. If the part has a customer replaceable unit (CRU) number, order it from your IBM Service Representative.

Parts for library

Table 18. Parts for the library

Feature Code (FC)	Product Description	CRU Part Numbers
N/A	Bar Code Scanner	18P7843
N/A	Front Door Key	18P7845
N/A	Library Chassis	18P7848
8036	Ultrium 3 Fibre Drive Sled	96P1286
8034	Ultrium 3 LVD Drive Sled	96P1364
8105	Ultrium 2 Fibre Drive Sled	18P7849
8103	Ultrium 2 LVD Drive Sled	18P7850
8104	Ultrium 2 HVD Drive Sled	18P7852
1660	RMU/Specialist	18P7847
1680	Control Path Failover	N/A
1681	Data Path Failover	N/A
2200	Stand-Alone Kit	24R1910
5096	Interposer SC-LC Fibre	11P1373
5098	Inline HVD SCSI Terminator	19P0378
5099	VHDCI/HD68 Cable/Interposer	19P0482
5301	0.4 m HD68/HD68 SCSI Cable	19P0872
5302	2.5 m HD68/HD68 SCSI Cable	35L1307
5305	5 m HD68/HD68 SCSI Cable	19P0052
5310	10 m HD68/HD68 SCSI Cable	19P0053
5318	18 m HD68/HD68 SCSI Cable	19P0097
5325	25 m HD68/HD68 SCSI Cable	19P0054
5602	2.5 m VHDCI/HD68 SCSI Cable	19P0279
5604	4.5 m VHDCI/HD68 SCSI Cable	19P0050
5610	10 m VHDCI/HD68 SCSI Cable	19P0048
5620	20 m VHDCI/HD68 SCSI Cable	19P0049
5625	25 m VHDCI/HD68 SCSI Cable	35L1977
5907	7 M SC-LC Fibre Cable	11P1345
5913	13 M SC-LC Fibre Cable	11P1346
5922	22 M SC-LC Fibre Cable	11P1347
5961	61 M SC-LC Fibre Cable	11P1350

Table 18. Parts for the library (continued)

Feature Code (FC)	Product Description	CRU Part Numbers
5907	7 M LC-SC Fibre Cable	11P3895
5913	13 M LC-SC Fibre Cable	11P3896
5922	22 M LC-SC Fibre Cable	11P3897
5961	61 M LC-SC Fibre Cable	11P3900
6005	5 M LC-LC Fibre Cable	19K1252
6013	13 M LC-LC Fibre Cable	11P3880
6025	25 M LC-LC Fibre Cable	19K1253
6061	61 M LC-LC Fibre Cable	11P3834
N/A	LVD single-connector SCSI wrap tool	19P0481
N/A	LVD multi-mode terminator	19P0874
7003	Rack Mount Kit	35L1559
8002	IBM TotalStorage Cleaning Cartridge	35L2087
8101	Five (5) IBM TotalStorage LTO Ultrium 200 GB Data Cartridges Note: The maximum number of FC 8101s that can be ordered at one time is four (4).	
8102	Magazine Kit w/ Dust Cover	
8110	Twenty (20) IBM TotalStorage LTO Ultrium 200 GB Data Cartridges Note: The maximum number of FC 8110s that can be ordered at one time is four (4).	
8203	Add CSU Ultrium 2 LVD Drive	18P7850
8204	Add CSU Ultrium 2 HVD Drive	18P7852
8205	Add CSU Ultrium 2 Fibre Drive	18P7849
8305	Five (5) IBM TotalStorage LTO Ultrium 400 GB Data Cartridges	
8320	Twenty (20) IBM TotalStorage LTO Ultrium 400 GB Data Cartridges	
9860	Rack Power Cord — Single (FC 7003 required)	05H8911
N/A	Input/Output (I/O) door	24R1144
N/A	4 library feet and 8 screws	24R1146
N/A	Miscellaneous screw kit	18P9169
Note: N/A = not applicable		

Power Cords



To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

Table 19 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 112 on page 239.

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 place of purchase.

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 19.

Power Cord Information

Table 19. Power cord information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 112 on page 239
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
Australia 2.8 m, 250V FC 9831 PN 39M5102	AS 3112 NZS 198	Argentina, Australia, China, Colombia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	3

Table 19. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 112 on page 239
France, Germany 2.8 m, 250V FC 9820 PN 13F9979	CEE 7 - VII	Afghanistan, Algeria, Andorra, Angola, Aruba, Austria, Belgium, Benin, Brazil, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo-Brazzaville, Curacao, Czech Republic, Democratic Republic of Congo, Denmark, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Kenya, Korea, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, Netherlands Antilles, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Russia, Saudi Arabia, Senegal, Spain, Sweden, Sudan, Syria, Togo, Tunisia, Turkey, 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
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

Table 19. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 112
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 112 shows the plugs that are used by the power cords in Table 19 on page 237. Match the index number that is beside each plug to the index number in the table.

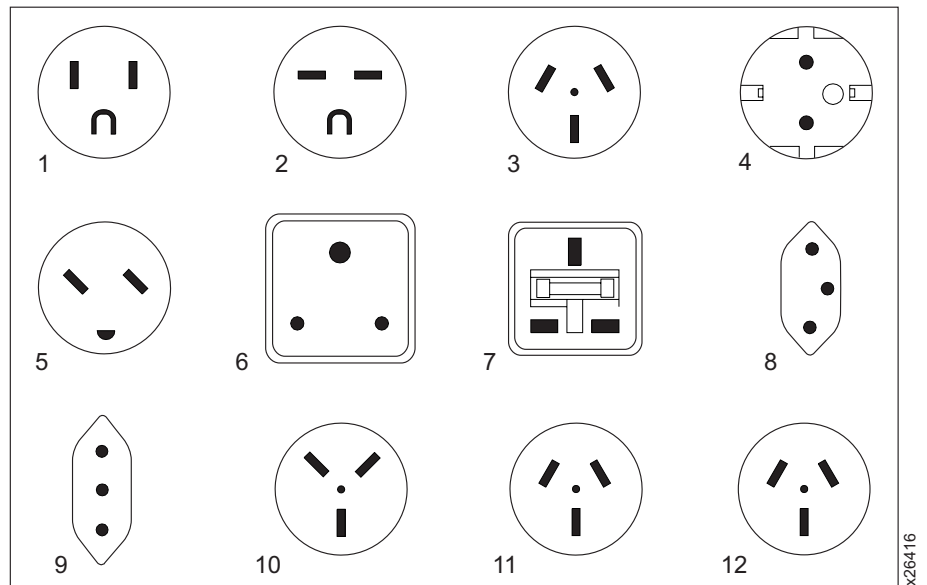


Figure 112. Types of receptacles

Part 4. Appendixes

Appendix A. Messages

This appendix contains the following sections:

- “Obtaining Tape Drive or Library Error Information at the Host”
- “Obtaining Error Information from an RS/6000 or pSeries”
- “Obtaining Service Information Message from an iSeries or AS/400” on page 250
- “Obtaining Error Information from a Sun System” on page 251
- “Obtaining Error Information from an HP-UX System” on page 251
- “Obtaining Error Information from a Linux System” on page 252
- “Fixing Fibre Channel Errors” on page 252
- “Fixing SCSI Bus Errors” on page 254

Obtaining Tape Drive or Library Error Information at the Host

IBM device drivers for the pSeries, RS/6000®, iSeries, and AS/400 systems log error information when an error occurs on a tape drive or library.

The error information includes the following:

1. Device VPD
2. SCSI command parameters
3. SCSI sense data (if available)

Obtaining Error Information from an RS/6000 or pSeries

The AIX Tape and Media Changer Device Driver for the pSeries or RS/6000 provides logging to the system error log for a variety of errors. You can view the error log by following this procedure.

- ___ 1. At the AIX command line, type **errpt l pg** to display a summary report, or type **errpt -a l pg** to display a detailed report. Press [Enter].

Note: In most cases you will use the summary report to find the date and time of any errors related to library devices, then use the detail report to obtain the sense data needed to identify the cause of the error.

- ___ 2. Press [Enter] to scroll through the error log.
- ___ 3. Type **q** and press [Enter], to quit the error log at any time.

To correct a problem you noticed in the **errpt** report, determine the type of error by using the examples that follow:

- For library errors [Resource Name = **smcn** (for example, smc0) and Resource Type = 3582]), refer to Figure 113 on page 245 and locate the SCSI sense data.
- For drive errors [Resource Name = **rmtn** (for example, rmt0) and Resource Type = LTO], refer to Figure 114 on page 246 and locate the SCSI sense data.
- For SCSI bus errors (not SCSI adapter errors), refer to Figure 115 on page 247 and Figure 116 on page 248 to determine which host adapter, SCSI bus, and device or devices are affected. After you have determined which device or devices are affected, go to “Fixing SCSI Bus Errors” on page 254 to resolve the problem.

- For Fibre Channel errors (not Fibre Channel adapter errors), determine which host adapter and device are affected, and go to “Fixing Fibre Channel Errors” on page 252.
- For SCSI adapter errors (not SCSI bus errors), use the maintenance package for the host.

Note: See Appendix B, “Sense Data,” on page 257 for further details on sense data.

Library Error Log Example

LABEL:TAPE_ERR2

IDENTIFIER:476B351D

Date/Time:Wed Oct 11 11:42:17

Sequence Number:25265

Machine ID:000D090D4C00

Node ID:tsm

Error Class:H

Error Type:PERM

Resource Name:smc0

Resource Class:tape

Resource Type:3582

Location:40-60-00-1,1

VPD:

Manufacturer.....IBM

Machine Type and Model.....ULT3582-TL

Serial Number.....000009418431

Device Specific . (FW)211B (Firmware Level)

Description
TAPE DRIVE FAILURE

Probable Causes
TAPE DRIVE

Failure Causes
TAPE
TAPE DRIVE

Recommended Actions
PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0C01 0000 A520 0000 0100 0010 0000 0000 0000 0000 7000 0400 0000 0046 0000 0000
1501 8000 0000 0000 0000 0000 0000 0000 0001 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

Figure 113. AIX ERRPT Library Error Log Example

Table 20. AIX ERRPT Library Sense Data

Hex	Description
A5	SCSI Command
0000, 0100, 0010	Command Parameters
70	Byte 0 of Library Sense Data
04	Sense Key
1501	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
80	Library SAC (Service Action Code)

Drive Error Log Example

```
LABEL:          TAPE_ERR1
IDENTIFIER:      4865FA9B

Date/Time:       Wed Oct 10 11:39:43
Sequence Number: 25264
Machine ID:      000D090D4C00
Node ID:         tsm
Class:           H
Type:            PERM
Resource Name:    rmt2
Resource Class:   tape
Resource Type:    LTO
Location:        40-60-00-1,0
VPD:
    Manufacturer.....IBM
    Machine Type and Model.....ULT3580-TD2
    Serial Number.....1300015078
    Device Specific.(FW).....3434 (Firmware Level)
Description
TAPE OPERATION ERROR

Probable Causes
TAPE

User Causes
MEDIA DEFECTIVE
DIRTY READ/WRITE HEAD

Recommended Actions
FOR REMOVABLE MEDIA, CHANGE MEDIA AND RETRY
PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0602 0000 0100 0000 0200 0000 0000 0000 0000 0000 7000 0300 0000 001C 0000 0000
5200 0700 20B0 0000 0000 0000 0000 0000 0000 0000 058A 0212 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

Figure 114. AIX ERRPT Drive Error Log Example

Table 21. AIX ERRPT Drive Sense Data

Hex	Description
01	SCSI Command
0000, 0200, 0000	Command Parameters
70	Byte 0 of Tape Drive Sense Data
03	Sense key (Hardware error in this example)
5200	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
20B0	FSC (Fault Symptom Code)
058A	Relative LPOS
02	SCSI ID

SCSI Bus Error Example

```
LABEL:          SCSI_ERR10
IDENTIFIER:      0BA49C99

Date/Time:      Wed Oct 17 09:55:32
Sequence Number: 16140
Machine Id:     00003ABF4C00
Node Id:        ofgtsm
Class:          H
Type:           TEMP
Resource Name:   scsi3
Resource Class:  adapter
Resource Type:   sym896
Location:        40-59
VPD:
    Product Specific.( ).....DUAL CHANNEL PCI TO ULTRA2 SCSI
                                ADAPTER
    Part Number.....03N3606
    EC Level.....F71335
    Manufacture ID.....A16592
    Serial Number.....0749

Description
SCSI BUS ERROR

Probable Causes
CABLE
CABLE TERMINATOR
DEVICE
ADAPTER

Failure Causes
CABLE LOOSE OR DEFECTIVE
DEVICE
ADAPTER

Recommended Actions
PERFORM PROBLEM DETERMINATION PROCEDURES
CHECK CABLE AND ITS CONNECTIONS

Detail Data
SENSE DATA
0001 0017 0000 0000 0000 0091 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 4304 0000 0000 0000 0000 2000 0003 0203 6760 9808 0000 F7FB E1B8
0000 0015 000B 0210 0678 C800 0000 8200 8277 1B20 00A2 ED00 0000 0002 FFFF FFFF
00FF 0000 111F F000 F3DF F110
```

Figure 115. Example of Error Suggesting SCSI Bus Problem, Which Takes Down Entire Bus

SCSI Bus Error Example

LABEL:TAPE_ERR4

IDENTIFIER:5537AC5F

Date/Time:Wed Oct 17 09:00:41

Sequence Number:16101

Machine Id:00003ABF4C00

Node Id:ofgtsm

Class:H

Type:PERM

Resource Name:smc0

Resource Class:tape

Resource Type:3582

Location:40-58-00-0,1

VPD:

Manufacturer.....IBM

Machine Type and Model.....ULT3582-TL

Serial Number.....000009418431

Device Specific.(FW).....211B

Description

TAPE DRIVE FAILURE

Probable Causes

ADAPTER

TAPE DRIVE

Failure Causes

ADAPTER

TAPE DRIVE

Recommended Actions

PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data

SENSE DATA

0600 0000 1200 0000 FF00 0000 0000 0000 0200 0800 0000 0000 0000 0000 0000 0000

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

Figure 116. SCSI Problem Points to Library Control Path as Possible Cause

Summary Report

1	2	3	4	5	6	7
FFE2F73A	1012150900	U	H	rmt5	UNDETERMINED ERROR	
0BA49C99	1012150800	T	H	scsi8	SCSI BUS ERROR	
C60BB505	1012141500	P	S		SOFTWARE PROGRAM ABNORM TERMINATED	
C42F11D4	1012105200	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1012105000	U	S	VSC:DE	SOFTWARE ERROR	
FFFA352B	1012104900	U	S	MS:CS	SOFTWARE ERROR	
FFFA352B	1012104900	U	S	MS:CS	SOFTWARE ERROR	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
C60BB505	1012082000	P	S		SOFTWARE PROGRAM ABNORM TERMINATED	
C42F11D4	1011183600	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011183300	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011181800	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011174700	U	S	VSC:DE	SOFTWARE ERROR	
FFFA352B	1011172900	U	S	MS:CS	SOFTWARE ERROR	
FFFA352B	1011172900	U	S	MS:CS	SOFTWARE ERROR	
C42F11D4	1011155300	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011153900	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011153800	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011150900	U	S	VSC:DE	SOFTWARE ERROR	

Figure 117. AIX ERRPT Commands Error Log Example

NUMBER	DESCRIPTION
1	Error ID
2	Timestamp
3	Error Type
4	Error Class
5	Resource Name
6	Error Description
7	How SCSI Bus Error will Display in Log

ERROR CLASS	DESCRIPTION
H	Hardware
S	Software
O	Informational

ERROR TYPE	DESCRIPTION
PEND	The availability loss of a device or component is imminent.
PERF	The performance of a device or component has degraded to an unacceptable level.
PERM	A hardware or software condition that could not be recovered from.
TEMP	A hardware condition that was recovered from after several unsuccessful attempts.
UNKN	The severity of the condition could not be determined.

A69M0170

Obtaining Service Information Message from an iSeries or AS/400

To gain access to the iSeries or AS/400 problem logs and error logs, sign on at any available workstation using the QSRV logon and its security password (QSRV). After sign on, the proper access authorizations will be granted and the iSeries or AS/400 MAIN MENU displays.

iSeries or AS/400 System with RISC Processor

- ___ 1. Type STRSST (Start System Service Tools) command on the command entry line on the iSeries or AS/400 Main Menu, and press **[Enter]**.
- ___ 2. On the "System Service Tool (SST)" screen, select **Start a service tool**, and press **[Enter]**.
- ___ 3. On the "Start a Service Tool" screen, select **Product activity log**, and press **[Enter]**.
- ___ 4. On the "Product activity log" screen, select **Analyze log**, and press **[Enter]**.
- ___ 5. On the "Select Subsystem Data" screen, select **Magnetic media**, enter the From and To time period for searching the error log, and press **[Enter]**.
- ___ 6. On the "Select Analysis Report Options" screen, select the following, and press **[Enter]**.
 - a. Report type. 1
 - b. Optional entries to include
 - 1) Informational YES
 - 2) Statistic NO
 - c. Reference code selection
 - 1) Option 1
 - 2) Reference codes. *ALL
 - d. Device selection
 - 1) Option 1
 - 2) Device type or resource names . . *ALL
- ___ 7. On the "Log Analysis Report" screen, enter a **5** on an error line that has a resource type of 3582 (library) or 3580 (drive), and press **[Enter]**.
- ___ 8. On the "Display Detail Report for Resource" screen, press:
 - F4=Additional Information.
Pressing F4 will display the machine type and serial number of the device. It also will display SCSI sense data, if available.
 - F6=Hexadecimal report.
Pressing F6 will display the device hexadecimal data (for support use).
 - F9=Address Information.
Pressing F9 will display the SCSI address information.

Obtaining Error Information from a Sun System

System log files are generally used to provide a time sequenced order of system events. In addition, various daemons write the file with adapter information and other information. There is always a current file and backup file. Depending on local set up, there maybe other files. If a system has been running a long time, the file may not contain the information recorded at boot time. It is highly recommended that the customer save the file that has boot time information, but at this time it is probably too late. On UNIX[®] based systems, the logs are typically written to a central location. On Solaris the file is found in `/var/adm/messages`. Note that there are also `messages.#` files, where the # is a number. When a messages file reaches a system defined limit, the file is renamed and older files are subsequently renumbered upwards. The date on the messages file is the last time the file was modified with data. The file that is required is the one that was recording information at the time of the problem.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

The two following service aid programs are provided with the IBM SCSI Tape Device Driver for SunOS:

- Tape service program

A tape service program called **tapesrv.c** is provided and contains the following service aids:

- Query device serial number
- Format tape
- Force device error dump
- Save device error dump
- Download device code

The tape service program is invoked by using the `/opt/stdutil/tapesrv` command.

Note: You must have root authority to run the tape service program.

The program is menu driven. Use discretion when running this program because it opens the device in diagnostic mode.

- Sample program

A sample program called **tapetest.c** is provided, which gives a demonstration of the device driver interface usage.

The sample program is invoked by using the `/opt/stdutil/tapetest` command. The program is useful for verifying that the device driver and the device are functional. The program is menu driven.

Obtaining Error Information from an HP-UX System

System log files are generally used to provide a time sequenced order of system events. In addition, various daemons write the file with adapter information and other information. There is always a current file and backup file. Depending on local set up, there maybe other files. If a system has been running a long time, the file may not contain the information recorded at boot time. It is highly recommended that the customer save the file that has boot time information, but at this time it is probably too late. On UNIX based systems, the logs are typically written to a central location. On HP the file is found in `/var/adm/syslog/syslog.log`.

There is an older version of the syslog.log file called OLDsyslog.log. The file that is required is the one that was recording information at the time of the problem.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

Obtaining Error Information from a Linux System

On Linux based systems, logs are typically written to a central location. On Linux the file is found in **/var/log/messages**. Note that there are also **messages.#** files, where # is a number. When a messages file reaches a system defined limit, the file is renamed and older files are subsequently renumbered upwards. The date on the messages file is the last time the file was modified with data. The command for listing a file along with the date is **ls -l**. The file that is required is the one that was recording information at the time of the problem. The IBMtape daemon also writes to two files, **/var/log/IBMtape.errorlog** and **/var/log/IBMtape.trace**. These files are archived when they reach a certain size with a timestamp date as part of the file name. Extract the required file for analysis. Consult the *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430, for setup and operation.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

Fixing Fibre Channel Errors

If you are connected to a Fibre Channel Storage Area Network (SAN) by using a SAN Data Gateway, use the *IBM Storage Area Network Gateway Module Setup, Operator, and Service Guide* to determine whether the problem is occurring between the drive and the SAN Data Gateway. If you are using a SCSI drive and are having SCSI problems, see "Fixing SCSI Bus Errors" on page 254.

Supported Topologies

The Ultrium 2 and 3 Tape Drives can be attached in a two-node configuration, either directly to a switch as a public device (switched fabric) or directly to a host bus adapter (HBA) as a private device. It can connect as a public device in a switched fabric topology (through an F_port) or connect using Arbitrated Loop topology (through an L_port or FL_port).

The tape drive automatically configures to an L_port or an N_port when it boots. The type of port to which it configures depends on whether the drive recognizes the connection as a loop or a point-to-point connection:

- An L_port supports a Fibre Channel Arbitrated Loop connection to an NL_port or FL_port.
- An N_port supports point-to-point connection to an F_port (for example, a director-class switch) in a switched fabric topology.

Regardless of the port to which you connect the drive, it automatically configures to a public device (through an F_port or FL_port to a switch) or to a private device (through an L_port by using direct attachment to a server).

Table 22 on page 253 lists the topologies in which the tape drive can operate, the Fibre Channel server connections that are available, and the port (NL, N, FL, or F) through which communication must occur.

Table 22. Choosing the port for your topology and Fibre Channel connection

Type of Topology	Type of Fibre Channel Connection to Server	
	Direct Connection (Private)	Switched Fabric (Public)
Fibre Channel-Arbitrated Loop (can be Two-Node Arbitrated Loop or Two-Node Switched Fabric Loop; is limited to two nodes)	L_Port	FL_Port
Switched fabric (two nodes)	N/A	F_Port

Starting Problem Determination

Before starting the problem determination, perform the following steps:

- ___ 1. Determine the type of Fibre Channel topology that you are using (see page 252). Ensure that the drive and the port to which it is attached are configured in compatible topologies.
- ___ 2. Using this guide or the service guides of associated switch, hub, or fiber products, try to determine where the problem exists (whether in the drive, cable, or the device to which the drive and cable attach).
- ___ 3. Ensure that the configuration and software levels are supported (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 3582 Tape Library.
 - Contact your IBM Sales Representative.
- ___ 4. Ensure that the Fibre Channel cables are installed correctly..
- ___ 5. Go to one of the following procedures:
 - “Fixing Consistent Fibre Channel Errors”
 - “Fixing Intermittent Fibre Channel Errors” on page 254

Fixing Consistent Fibre Channel Errors

- ___ 1. Ensure that the tape drive is powered on.
- ___ 2. Verify that the tape drive’s serial number is the same as the drive serial number that the server program is using.
- ___ 3. If connected in an Arbitrated Loop topology, ensure that the drive’s Fibre Channel AL_PA is set correctly, that it is on the loop, and that it is not being used by another device (see “SCSI and Fibre Channel Loop ID Settings” on page 108). The tape drive must be able to detect light and communicate with the server.
- ___ 4. Run the Fibre Channel wrap test at the drive’s Fibre Channel connector (see “Drive Maintenance Test” on page 155).
 - If the test fails, replace the tape drive.
 - If the test is successful, go to step 5.
- ___ 5. Run the Fibre Channel wrap test at the end of the fiber cable (see “Drive Maintenance Test” on page 155).

- If the test fails, replace the fiber cable.
- If the test is successful, go to step 6.
- ___ 6. Check the Fibre Channel cable connection at the server.
- ___ 7. Using a device driver utility such as *ntutil* or *tapeutil*, verify that the drive is properly configured and available at the server.
- ___ 8. If the problem persists, the fault may be with the server's hardware or software. Refer to your server's service manual.
- ___ 9. When the problem is corrected (or determined to be a server problem), restore all of the fiber cables to their correct position.

Fixing Intermittent Fibre Channel Errors

- ___ 1. Determine the type of Fibre Channel topology that you are using (see "Supported Topologies" on page 252).
- ___ 2. Ensure that the configuration and software levels are supported (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 3582 Tape Library**.
 - Contact your IBM Sales Representative.
- ___ 3. Check that each Fibre Channel cable meets the requirements specified in "Using the Fibre Channel Interface" on page 40.
- ___ 4. Ensure that all Fibre Channel cables are installed correctly.
- ___ 5. Using this guide or the service guides of associated switch, hub, or fiber products, determine that a problem exists between the drive, drive cable, and the device to which they attach. Try to isolate which part of the Storage Area Network (SAN) is experiencing problems.
- ___ 6. Using this guide or the service guides of associated switch, hub, or fiber products, verify that the SAN configurations are correct (such as switch zoning for drive sharing).
- ___ 7. Obtain all errors reported by the drive to the server (see "Using Host Sense Data" on page 267), then contact IBM Technical Support.

Fixing SCSI Bus Errors

Fixing a Consistent Error with a Single Drive on a SCSI Bus

- ___ 1. Ensure that the power is ON to the tape drive.
- ___ 2. Ensure that the tape drive's SCSI address is the same as the SCSI address assigned by the server.
- ___ 3. See "Drive Maintenance Test" on page 155 and select the Wrap test.
 - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable and the interposer (if installed). Repeat the operation that caused the error. If you replaced the SCSI terminator or SCSI cable and the problem persists, the fault is with the server's hardware or software. To isolate the cause of the failure, refer to the server's service documentation.
 - If the test fails, replace the tape drive (see Chapter 9, "Removal and Replacement Procedures," on page 207).

Fixing a Consistent Error with Multiple Drives on a SCSI Bus

When a consistent error occurs in a configuration that has multiple tape drives on the SCSI bus, you must determine if the problem exists with more than one tape drive. If the problem is with all of the devices on the SCSI bus, the bus is stuck in a SCSI phase and cannot change to another phase, or the SCSI cable from the server to the first device is defective. Use the following steps to isolate and correct the error.

- ___ 1. Ensure that the SCSI cable from the server to the first device is connected. If not, reconnect the cable, and determine if the problem still exists. If the cable was properly connected, go to step 2.
- ___ 2. Stop all activity to the drives.
- ___ 3. Disconnect all SCSI connections to drive 1, drive 2, and the host.
- ___ 4. Connect the SCSI wrap tool to the SCSI connector of the first tape drive that was connected to the server. Connect the SCSI terminator to the other connector.
- ___ 5. Run the SCSI wrap test on the first drive (See “Drive Maintenance Test” on page 155, Wrap Test). If the test fails, replace the first drive (see Chapter 9, “Removal and Replacement Procedures,” on page 207). If the test runs successfully, continue to step 6.
- ___ 6. Disconnect the SCSI wrap tool from the first drive, and reconnect the SCSI connection from the host to the first drive. Keep the SCSI terminator on the other SCSI connector of the first drive. Run a device driver utility (such as IBM’s *ntutil* or *tapeutil*). If the error occurs, the problem may be in the SCSI cable from the host, or in the host itself. If no error occurs, continue to step 7.
- ___ 7. Using steps 3 and 4, run the wrap test on the second drive. If the test fails, replace the second drive (see Chapter 9, “Removal and Replacement Procedures,” on page 207). If the test passes, continue to step 8.
- ___ 8. Remove the SCSI wrap tool from the second drive, and reconnect the first drive to the second drive with a SCSI cable. Keep the SCSI terminator on the other SCSI connector of the second drive.
- ___ 9. Run a device driver utility (such as IBM’s *ntutil* or *tapeutil*) to send data to the second drive. If the error occurs, replace the SCSI cable connecting the two drives. If the test passes, continue to step 10.
- ___ 10. Run a device driver utility (such as IBM’s *ntutil* or *tapeutil*) to send data to both drives. If there is no longer a problem, the problem was most likely with the connections on the SCSI bus.
- ___ 11. If the problem persists, there is most likely a contention or protocol issue on the bus. Resolving this will involve host bus adapter and host software diagnostics. Contact those support organizations for assistance. Contact IBM technical support for additional assistance.

Fixing an Intermittent Error with a Single Drive on a SCSI Bus

- ___ 1. Replace the SCSI terminator on the tape drive.
- ___ 2. Run the operation that caused the error. If the problem persists, the problem may be with the cable.
- ___ 3. Isolate which cable is causing the problem by replacing one cable at a time and running the operation that caused the error after each replacement. If the problem persists after all cables have been replaced, the problem may be with the tape drive.

- ___ 4. Replace the tape drive (see Chapter 9, "Removal and Replacement Procedures," on page 207). If the problem persists, the problem is with your server. Consult your server's documentation.

Fixing an Intermittent Error with Multiples Drives on a SCSI Bus

Refer to the server's error logs to determine which tape drive is the source of the problem:

- If only one tape drive is reporting a SCSI failure, replace that tape drive (see Chapter 9, "Removal and Replacement Procedures," on page 207).
- If multiple tape drives are reporting SCSI failures, the problem may be with the terminator or the SCSI cables:
 - Replace the terminator and run the operation that caused the error. If the problem persists, the problem may be with the cables.
 - Isolate which cable is causing the problem by replacing one cable at a time and run the operation that caused the error after each replacement.

Appendix B. Sense Data

This appendix contains the following sections:

- “Library Sense Data”
- “Drive Sense Data” on page 262
- “Using Host Sense Data” on page 267

Library Sense Data

Table 23. Sense Information Format

Bits	7	6	5	4	3	2	1	0
Bytes								
0	Valid	70 = Existing Error 71 = Deferred Error						
1	Reserved							
2	Reserved				Sense Key (see Table 24 on page 258)			
3	MSB Information Bytes LSB							
:								
6								
7	Additional Sense Length (n-7) If the sense key is 4, the additional sense length is 70. For all other errors, the additional sense length is 10.							
8	MSB Command Specific Bytes LSB							
:								
11								
12	Additional Sense Code (ASC) (see Table 25 on page 258)							
13	Additional Sense Qualifier (ASCQ) (see Table 25 on page 258)							
14	Service Action Code							
15	SKSV	C/D	Reserved		BPV	Bit Pointer		
16	MSB Field Pointer LSB							
17								

Table 24. Sense Keys

Sense Key	Description
0h	No Sense. No specific sense key information to report.
2h	Not Ready. The library is not ready to perform motion commands.
4h	Hardware Error. A hardware error was detected and operator intervention may be required.
5h	Illegal Request. The CDB or supplied parameter data contains an unsupported or illegal parameter.
6h	Unit Attention. The library operating status changed. The cartridge inventory may be invalid.
Bh	Command Aborted. The library aborted a command. The initiator may try the command again.

Table 25. Additional Sense Codes and Qualifiers (Bytes 12 & 13)

Sense Key	Condition	ASC	ASCQ	Description
00h	No Sense	00h	00h	No Additional Sense Code.
02h	Not Ready	04h	00h	The library is not ready due to an unknown cause.
			01h	The library is becoming ready.
			03h	The library is not ready and a manual intervention is required.
			83h	A door is open and a magazine is missing.
			8Dh	Offline

Table 25. Additional Sense Codes and Qualifiers (Bytes 12 & 13) (continued)

04h	Hardware Error	15h	01h	A mechanical positioning error occurred.
			80h	The medium changer lost a cartridge.
			81h	The medium changer could not pick a cartridge.
			83h	The medium changer could not place a cartridge.
		3Bh	0Dh	The destination element is full.
			0Eh	The source element is empty.
		3Fh	80h	Could not erase EEPROM.
			84h	Could not program EEPROM.
		40h	01h	Cartridge in gripper at power-on.
			80h	Component (number - 80) failure.
			91h	Picker error.
			A0h	Could not move on the extend (Z) axis.
			A1h	Could not home the extend (Z) axis.
			B0h	Could not move on the horizontal (X) axis.
			B1h	Could not home the horizontal (X) axis.
			C0h	The medium changer could not move.
			E0h	The medium changer lost power.
		44h	00h	Internal target failure.
		53h	00h	A drive did not load or unload a cartridge.
			82h	Cannot lock the I/E station.
			83h	Cannot unlock the I/E station.
		55h	00h	A system device is not available.
		83h	00h	The bar code label is questionable.
			01h	Label too short, too long or duplicate.
			03h	Cell status and bar code questionable.
			09h	The bar code label is missing.
		84h	00	Firmware error.

Table 25. Additional Sense Codes and Qualifiers (Bytes 12 & 13) (continued)

05h	Illegal Request	1Ah	00h	Parameter List length error.
		20h	00h	Illegal opcode in CDB.
		21h	01h	Invalid element address in CDB.
		24h	00h	Invalid field in CDB.
			80h	Attempt to write a read-only buffer.
		25h	00h	Illegal LUN.
		26h	00h	Invalid field in Parameter List.
			01h	A Parameter is not supported.
			02h	Invalid parameter in Parameter List.
			80h	Parameter data checksum failure.
		30h	00h	Incompatible media installed.
		3Bh	0Dh	Destination element full for MOVE MEDIUM command.
			0Eh	Source element empty for MOVE MEDIUM command.
			85h	Destination of MOVE MEDIUM command cannot be medium changer.
			86h	Source of MOVE MEDIUM command cannot be medium changer.
			87h	Cartridge stuck in tape drive.
			90h	Source cartridge loaded into tape drive and not accessible.
			A0h	Media type does not match destination media type.
		3Dh	00h	Invalid bit in "Identify" message.
		3Eh	00h	Incorrect LUN configuration.
		44h	00h	Firmware detected an internal logic failure.
		53h	01h	A drive did not unload a cartridge.
			80h	Cartridge rejected in the insert/eject station because it was not properly loaded.
			81h	The insert/eject station magazine was removed.
		55h	00h	A system device is not available.
		83h	00h	Bar code label is questionable.
			01h	Label is too short, too long or duplicate.
			02h	Cartridge magazine not installed.
			03h	Cell status and bar code questionable.
			04h	Drive not installed.
			09h	The bar code label is missing.

Table 25. Additional Sense Codes and Qualifiers (Bytes 12 & 13) (continued)

06h	Unit Attention	28h	00h	Door or doors opened and closed.
			01h	Insert/eject station status changed.
		29h	00h	Power-on, SCSI bus reset, or Bus device reset occurred.
			80h	Reset for permanent error occurred.
			81h	Reset into degraded mode of operation.
		2Ah	01h	Mode parameters have been changed.
		3Fh	01h	New firmware loaded.
0Bh	Abort	43h	00h	Message received at inappropriate time.
		45h	00h	Host rejected "Identify" message sent for reselection.
		47h	00h	Message system was disabled during parity error detection on SCSI bus, message system enabled but initiator rejected "Restore Data Pointer," or all parity error retries exhausted.
		48h	00h	Received an "Initiator Detected Error" or initiator rejected "Restore Data Pointer" in response to an "Initiator Detected Error."
		4Eh	00h	Disconnect during command processing.

Drive Sense Data

Table 26. LTO Tape Drive Sense Data

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
0	Address valid When set to 1, the info byte field contains a valid logical block address.	Error Code						
1	Segment Number (0)							
2	Filemark	EOM (end of medium)	ILI (Incorrect length indicator)	Reserved	Sense Key		Description	
					0	---	No sense	
					1	---	Recovered error	
					2	---	Not ready	
					3	---	Media error	
					4	---	Hardware error	
					5	---	Illegal request	
					6	---	Unit attention	
					7	---	Data protect	
					8	---	Blank Check	
					9	---	Reserved	
					A	---	Reserved	
					B	---	Aborted command	
					C	---	Reserved	
	D	---	Volume overflow					
	E	---	Reserved					
	F	---	Reserved					
3	Information byte (most significant byte)							
4	Information byte							
5	Information byte							
6	Information byte (least significant byte)							
7	Additional Sense Length							
8–11	Command specific information							

Table 26. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) Additional Sense Code Qualifier (ASCQ) Byte 12 Byte 13 ASC ASCQ							
	00	00 - No additional sense — The flags in the sense data indicate the reason for the command failure						
	00	01 - Filemark detected — A Read or Space command terminated early due to an FM. The FM flag is set.						
	00	02 - EOM — A Write or Write File Marks command failed because the physical end of cartridge was encountered, or a Read or Space command encountered EOM. The EOM flag is set						
	00	04 - BOM — A space command ended at Beginning of Tape. The EOM bit is also set						
	00	05 - EOD — Read or Space command terminated early because End of Data was encountered						
	04	00 - Cause not reportable — A cartridge is present in the drive, but it is in the process of being unloaded						
	04	01 - Becoming Ready — A media access command was received during a front panel initiated load or an immediate reported load command						
	04	02 - Initializing Command Required — A cartridge is present in the drive, but is not logically loaded. A Load command is required						
	04	03 - Manual Intervention Required — A cartridge is present in the drive but could not be loaded or unloaded without manual intervention						
	04	10 - Logical Unit Not Ready, Auxiliary Memory Not Accessible						
	0C	00 - Write Error — A Write operation has failed. This is probably due to bad media, but may be hardware related						
	11	00 - Unrecovered Read Error — A Read operation failed. This is probably due to bad media, but may be hardware related						
	11	12 - Auxiliary Memory Read Error						
	14	00 - Recorded Entity Not Found — A space or Locate command failed because a format violation prevented the target from being found.						
	14	03 - End Of Data not found — A Read type operation failed because a format violation related to a missing EOD data set						
	1A	00 - Parameter list length error — The amount of parameter data sent is incorrect						
	20	00 - Invalid Command Operation Code — The Operation Code in the command was not a valid Operation Code						
	24	00 - Invalid field in CDB — An invalid field has been detected in a Command Descriptor Block						
	25	00 - LUN not supported — The command was addressed to a non-existent logical unit number						
	26	00 - Invalid Field in Parameter List — An invalid field has been detected in the data sent during the data phase						
	27	00 - Write Protect — A Write type operation has been requested on a cartridge which has been write protected						
	28	00 - Not Ready to Ready Transition — A cartridge has been loaded successfully into the drive and is now ready to be accessed						
	29	00 - Reset — The drive has powered on, received a reset signal or a bus device reset signal since the initiator last accessed it						
	2A	01 - Mode Parameters Changed — The Mode parameters for the drive have been changed by an initiator other than the one issuing the command						
	30	00 - Incompatible Media Installed — A write type operation could not be executed because it is not supported on the cartridge type that is loaded						
	30	01 - Unknown Format — An operation could not be carried out because the cartridge in the drive is of a format not supported by the drive						

Table 26. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) — Additional Sense Code Qualifier (ASCQ) (Continued)							
	Byte 12	Byte 13						
	ASC	ASCQ						
30	02	- Incompatible Format — An operation could not be completed because the Logical Format is not correct						
30	03	- Cleaning Cartridge Installed — An operation could not be carried out because the cartridge in the drive is a cleaning cartridge						
30	07	- Cleaning Failure — A cleaning operation was attempted, but could not be completed for some reason						
30	0C	- Data Protect/WORM Medium — Overwrite Attempted: Set when the drive rejects a Write operation because the rules for allowing WORM writes have not been met.						
30	0D	- Medium Error/WORM Medium - Integrity Check: Set when the drive rejects a Read operation because the current cartridge is a Suspicious WORM cartridge, and the WTRE bit is set to 0.						
31	00	- Media format corrupted — Data could not be read because the format on cartridge is not valid, but is a known format. A failure occurred attempting to write the FID						
37	00	- Rounded parameter — A Mode Select command parameter has been rounded because the drive can not store it with the accuracy of the command.						
3A	00	- Media Not Present — A media access command has been received when there is no cartridge loaded						
3B	00	- Sequential Positioning Error — A command has failed and left the logical position at an unexpected location						
3D	00	- Invalid bits in identify Message — An illegal Identify Message has been received at the drive at the start of a command						
3E	00	- Logical Unit has not Self-Configured — The drive has just powered on and has not completed its self test sequence and can not process commands						
3F	01	- Code Download — The firmware in the drive has just been changed by a Write Buffer command						
40	xx	- Diagnostic failure — A diagnostic test has failed. The xx (ASCQ) is a vendor specific code indicating the failing component.						
43	00	- Message Error — A message could not be sent or received due to excessive transmission errors						
44	00	- Internal target failure — A hardware failure has been detected in the drive that has caused the command to fail						
45	00	- Select/Reset Failure — An attempt to reselect an initiator in order to complete the command has failed						
4B	00	- Data Phase Error — A command could not be completed because too many parity errors occurred during the Data phase						
4E	00	- Overlapped Commands — An initiator selected the drive even though it already had a command outstanding in the drive						
50	00	- Write Append Error — A write type command failed because the point at which to append data was unreadable						
51	00	- Erase failure — An Erase command failed to erase the required area on the media						
52	00	- Cartridge fault — A command could not be completed due to a fault in the cartridge						
53	00	- Media Load/Eject Failed — (Sense Key 03) An attempt to load or eject the cartridge failed due to a problem with the cartridge.						
53	00	- Media Load/Eject Failed — (Sense Key 04) An attempt to load or eject the cartridge failed due to a problem with the drive						

Table 26. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) — Additional Sense Code Qualifier (ASCQ) (Continued) Byte 12 Byte 13 ASC ASCQ 53 02 - Media Removal Prevented — An Unload command has failed to eject the cartridge because media removal has been prevented 5D 00 - Failure Prediction Threshold — Failure Prediction thresholds have been exceeded indicating that a failure may occur soon 5D FF - Failure Prediction False — A Mode Select command has been used to test for Failure Prediction system. 82 82 - Drive requires cleaning — The drive has detected that a cleaning operation is required to maintain good operation 82 83 - Bad Code Detected — The data transferred to the drive during a firmware upgrade is corrupt or incompatible with drive hardware							
14	FRU code							
15	SKSV	C/D	Reserved		BPV	Bit pointer		
					When set to 1, the bit pointer is valid.			
16–17	SKSV = 0: First Error Fault Symptom Code (FSC). SKSV = 1: Field Pointer							
18–19	First Error Flag Data							
20	Reserved (0)							
21					CLN	Reserved	Reserved	VolValid
22–28	Volume Label							
29	Current® Wrap							
30–33	Relative LPOS							
34	SCSI Address							
35	Reserved				Reserved			

The descriptions below serve only as an overview of sense reporting in the tape drive. This tape drive conforms to all sense field reporting as specified in the SCSI standards.

Notes:

1. The Error Code field (Byte 0) is set to 70h to indicate a current error, that is one associated with the most recently received command. It is set to 71h to indicate a deferred error which is not associated with the current command.
2. The segment number (Byte 1) is zero since the Copy, Compare, and Copy and Verify commands are not supported.
3. The File Mark flag (Byte 2, bit 7) is set if a Space, Read, or Verify command did not complete because a file mark was read.
4. The End of Media (EOM) flag (Byte 2, bit 6) is set if a Write or Write File Marks command completed in the early warning area. Spacing into BOM also causes this flag to be set. It is also set on an attempt to read or space past EOD, or if an attempt is made to space into Beginning of Media.

5. The Illegal Length Indicator (ILI) flag (Byte 2, bit 5) is set if a Read or Verify ended because a block was read from cartridge that did not have the block length requested in the command.
6. The Information Bytes (Bytes 3–5) are only valid if the Valid flag is set. This occurs only for current errors and not for deferred errors.
7. The Field Replaceable Unit field (Byte 14) is set to either zero or to a non-zero, vendor-specific code indicating which part of the drive is suspected of causing the failure.
8. The Clean (CLN) flag (Byte 21, bit 3) is set if the drive needs cleaning and clear otherwise.
9. The Volume Label Fields Valid (VolValid) bit (Byte 21, bit 0) is set if the Volume Label being reported is valid.
10. The Volume Label field (Bytes 22–28) reports the volume label if a cartridge is loaded in the drive and Volume Label Fields Valid is set.
11. The Current Wrap field (Byte 29) reports the physical wrap of the cartridge. The least significant bit reflects the current physical direction. A 0 means that the current direction is away from the physical beginning of the cartridge. A 1 means that the current direction is towards the physical beginning of the cartridge.
12. Relative LPOS fields (Bytes 30–33) reports the current physical position on the cartridge.
13. SCSI Address field (Byte 34) reports the SCSI Bus Address for the drive. Values returned range from 00h to 0Fh.

Using Host Sense Data

Table 27 lists the hosts to which the Ultrium 2 Tape Drive attaches. It gives the operating system for each host and describes how the host records errors from the Ultrium 2 Tape Drive.

To determine the meaning of host sense data, refer to the *IBM Ultrium Device Drivers Installation and User's Guide*.

<http://www.ibm.com/storage/storagesmart/lto>

Table 27. Host Method of Recording Tape Drive Errors

Host	Operating System	Method of Recording Tape Drive Errors
IBM AS/400 or iSeries	OS/400	Records tape drive errors and associated sense data in the AS/400 problem and error logs. View the logs by using the System Service Tools application and the userid QSRV.
IBM RS/6000, RS/6000/SP, or pSeries	AIX	Uses the IBM Atape device driver (provided with the Ultrium 2 Tape Drive) to record tape drive errors and sense data in the host error log. View the host error log by using one or more of the following utilities: tapeutil, diag, smit, or errpt.
HP	HP-UX	Uses the IBM device driver for HP. Error and trace logging are proprietary to Hewlett-Packard.
Sun Microsystems	Solaris	Uses the IBM device driver for Solaris to post sense information to the Solaris host-wide messages file <i>/var/adm/messages</i> .
Intel-based PCs	Windows NT [®]	Uses the NTUTIL device driver to log some sense data in the Event Viewer host log.

Appendix C. Element Addressing

A host initiator references a storage location with element addresses. The library uses a default addressing scheme, as seen in Table 28 for a non-partitioned library, or Table 28 and Table 29 for a partitioned library. Storage slots are addressed left to right, front to back. Drives are addressed left to right. The I/O station contains a single slot.

All addresses are consecutive within their device type. Elements may not be installed, and will be indicated as such in Read Element Status requests.

Table 28. Default Addressing Scheme for Partition One

Cell Definition	Addressing Range
Storage Slot (Storage Elements)	4096 (0x1000) through 4118 (0x1016)
I/O Station (Input/Output Elements)	16 (0x10)
Tape Drive (Data Transport Elements)	256 (0x100)
Medium Changer (Media Transport Element)	1 (0x01)
Note: For a partitioned library, partition 1's upper slot number is limited to the number of slots configured.	

Table 29. Default Addressing Scheme for Partition Two (if applicable)

Cell Definition	Addressing Range
Storage Slot (Storage Elements)	8192 (0x2000) through as many slots as configured in each partition
I/O Station (Input/Output Elements)	16 (0x10)
Tape Drive (Data Transport Elements)	512 (0x200)
Medium Changer (Media Transport Element)	1 (0x01)
Note: The default addressing scheme for partition two is the same as partition one for release 211B.	

Appendix D. TapeAlert Flags

TapeAlert is a patented technology and standard of the American National Standards Institute (ANSI) that defines conditions and problems that are experienced by tape drives. The technology enables a server to read TapeAlert flags from a tape drive through the SCSI interface. The server reads the flags from Log Sense Page 0x2E. This appendix lists the TapeAlert flags that are supported by the library and the drive.

TapeAlert Flags Supported by the Library

Table 30. TapeAlert Flags Supported by the library

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.
16	Library door	A library door is open and prevents the library from functioning.	Close the library door.
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.
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.
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.

TapeAlert Flags Supported by the Drive

Table 31. TapeAlert flags supported by the drive

TapeAlert Flags Supported			
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 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Drive Error Codes" on page 195.
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 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see "Write-Protect Switch" on page 169). If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Drive Error Codes" on page 195.
8	Not data grade	Set when severe servo errors occur while loading a tape cartridge.	Replace the tape cartridge. If this error occurs with multiple cartridges, see error code 6 in "Drive Error Codes" on page 195.
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 "Write-Protect Switch" on page 169).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server's operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.
14	Unrecoverable snapped tape	Set when the tape split apart.	Manually remove the tape cartridge (see Appendix F, "Removing a Tape Cartridge," on page 277).
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the cartridge. If this error occurs on multiple tapes, see error code 6 in "Drive Error Codes" on page 195.

Table 31. TapeAlert flags supported by the drive (continued)

TapeAlert Flags Supported			
Flag Number	Flag	Description	Action Required
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive.
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon.
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 tape drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs which requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see "Drive Error Codes" on page 195 for the appropriate instructions.
31	Hardware B	Set when the tape drive fails its internal Power-On Self Test (POST).	Note the error code on the single-character display and see "Drive Error Codes" on page 195 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI or RS-422 interface.	See error code 8 or 9 in "Drive Error Codes" on page 195.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive and discard it.	Unload and reload the tape cartridge.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive over the SCSI interface.	Download the FMR image again (ensure that it is the correct image).
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the enclosure (see Thermal Environment in "Specifications" on page 16).	See error code 1 in "Drive Error Codes" on page 195.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are approaching the specified voltage limits or are outside the voltage limits (see Power in "Specifications" on page 16).	See error code 2 in "Drive Error Codes" on page 195.

Table 31. TapeAlert flags supported by the drive (continued)

TapeAlert Flags Supported			
Flag Number	Flag	Description	Action Required
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics to isolate the problem.	See error code 6 in "Drive Error Codes" on page 195.
51	Tape directory invalid at unload	For the tape that was unloaded, set when the tape directory on the cartridge memory is corrupted.	If the problem continues after successive loads, replace the cartridge. If the problem persists, replace the drive.
52	Tape system area write failure	Set when the tape that was unloaded could not write its system area (FID) successfully.	1. Copy the data to another tape cartridge. 2. Discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at load time.	1. Copy the data to another tape cartridge. 2. Discard the old cartridge.
59	WORM Medium - Integrity Check Failed	Set when the drive determines that the data on tape is suspect from a WORM point of view.	Review data in accordance with your WORM data retention procedures. Replace cartridge, if necessary.
60	WORM Medium - Overwrite Attempted	Set when the drive rejects a Write operation because the rules for allowing WORM writes have not been met.	Illegal operation (violation of WORM rules).

Appendix E. Connecting to the Serial Port

The Library's serial port is an RS-232C DTE port, configured at 19 200 Baud, with 8 data bits, no parity, and no flow control. The optional RMU's serial port is an RS-232C DTE port, configured at 38 400 Baud, with 8 data bits, no parity, and no flow control. The 9-pin connector is compatible with serial ports on PCs. A PC can be used to connect to the service port using a 9-pin straight through cable. For connection to another system, such as a UNIX workstation, a different cable or an adapter might be required.

Serial Port Connections

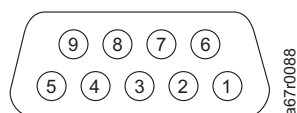


Figure 118. Serial Port Pin-Out

Table 32. DB-9 RS-232 Connector Pin Assignments

Pin Number	Signal Name	Abbreviation	Direction Relative to the Library/RMU
1	Carrier detect	CD	In
2	Receive data	RD	In
3	Transmit data	TD	Out
4	Data terminal ready	DTR	Out
5	Signal ground	SG	-
6	Data set ready	DSR	In
7	Request to send	RTS	Out
8	Clear to send	CTS	In
9	Ring indicator	RI	In

Connecting to the Serial Terminal

This section contains the hardware information needed to interconnect the serial terminal.

Hardware Required

- RS-232 DB9F-to-DB9F straight through cable
- Desktop computer or laptop computer, or a 232 DTE terminal, or a desktop or laptop computer that runs terminal emulation software
- RS-232 DB9M to DB25F adapter if the terminal uses a DB25M connector

Configuring HyperTerminal for Connection to the 3582 Library

HyperTerminal is a serial communications software provided with all PCs with a Windows operating system.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application's documentation for instructions.

To use HyperTerminal, follow these instructions:

- ___ 1. Start the HyperTerminal program. Select **Start, All Programs, Accessories, Communications, and HyperTerminal**. If you don't have a HyperTerminal icon on the Accessories drop down menu, go to **Communications** first.
- ___ 2. If the 'New Connection' screen is displayed, you must select a name and an icon for this connection. Type **3582** in the name field, and select an icon from the list. Click on **OK**.
- ___ 3. If the 'Connect to 3582' screen is displayed, ensure that the 'Connect Using' field is set to the appropriate serial port on your computer, (for example, COM1). Click on **OK**.
- ___ 4. If the 'COM1 Properties' screen is displayed, select the following settings:
 - **Bits per Second:** 19200
 - **Data Bits:** 8
 - **Parity:** None
 - **Stop Bits:** 1
 - **Flow Control:** None
- ___ 5. Click on the **File** pulldown menu, then click on **Properties**. Click on the **Settings** tab. Click on the **ASCII Setup** button. Ensure that the 'Echo Typed Characters Locally' field is checked. Click on **OK** (twice).
- ___ 6. Exit the HyperTerminal program.
- ___ 7. If the 'You are currently connected. Are you sure you want to disconnect now?' screen is displayed, click on **YES**.
- ___ 8. If the 'Do you want to save session 3582?' screen is displayed, click on **YES**.

Verifying the Connection

If the Library/RMU is already on, then characters typed in the terminal should be visible to the operator. The simplest test is to press the Enter key. The Library will respond by displaying a command prompt like:

```
LIBCMD >
```

The RMU will respond by displaying a command prompt like:

```
RMU
```

When the device is rebooting, several messages are displayed on the terminal emulator.

Appendix F. Removing a Tape Cartridge

If a cartridge fails to eject from the library there are two methods to remove the cartridge. The following sections describe the two procedures, resetting the drive and ejecting the cartridge, and manually removing the cartridge.

Resetting the Drive and Ejecting the Cartridge

If a cartridge fails to eject from the library, you can perform the following steps to reset the drive and eject the cartridge.

For Ultrium 3 drives only. Before attempting to remove a tape from the drive, it is *very important* to preserve the active dump information in non-volatile storage in case the drive has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:



Path: Main Menu —> Tools Menu —> Drive Maint —> Prsrv Dump

For procedure instructions, see 156.

- ___ 1. Vary the library and drives offline to *all* attached hosts.
- ___ 2. Remove the right-hand cartridge magazine.

Note: Ensure that you do not interchange magazines if you remove both.

- ___ 3. Locate the drive that is not ejecting the cartridge. If the picker is in front of the drive, use the Operator Panel to move the picker to target position 1 (Main Menu —> Tools Menu —> Position Picker). See “Position Picker” on page 160.
- ___ 4. Carefully reach through the magazine slot, then press and release the eject button **3** on the front of the drive and wait for approximately two minutes. If the cartridge ejects the procedure was successful. If the cartridge does not eject continue with the next step.

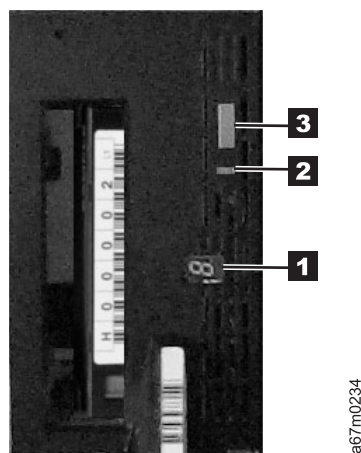


Figure 119. Resetting the Tape Drive

- ___ 5. Press and hold the eject button **3** for at least 10 seconds. The single character display **1** should change as the drive performs a power-on self test (POST). If this does not happen cycle power to the library (turn it off, then on again).
- ___ 6. After a reset or power cycle, the drive should start a slow rewind. During the slow rewind the activity LED **2** will be flashing. You must wait for the LED to stop flashing, indicating that the slow rewind is complete. **This process may take up to 20 minutes.**
- ___ 7. Press and release the eject button **3** on the front of the drive and wait for approximately two minutes. If the cartridge ejects the procedure was successful. If the cartridge does not eject continue with the following procedure.

Manually Removing a Tape Cartridge from an Ultrium 3 Tape Drive

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 cartridge will void your warranty.

For Ultrium 3 drives only. Before attempting to remove a tape from the drive, it is *very important* to preserve the active dump information in non-volatile storage in case the drive has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Execute the following sequence **before** powering OFF the drive:



Path: Main Menu → Tools Menu → Drive Maint → Prsrv Dump

For procedure instructions, see 156.

Removing the Drive from the Drive Sled



CAUTION:

It is critical to maintain the alignment of the drive on the drive sled.

1. Carefully scribe a line on the drive sled on each side of the drive to mark the drive position on the sled. See Figure 120.



Figure 120. Scribing

2. Unplug the RS422 cable from the rear of the drive sled. See **1** in Figure 121 on page 280.

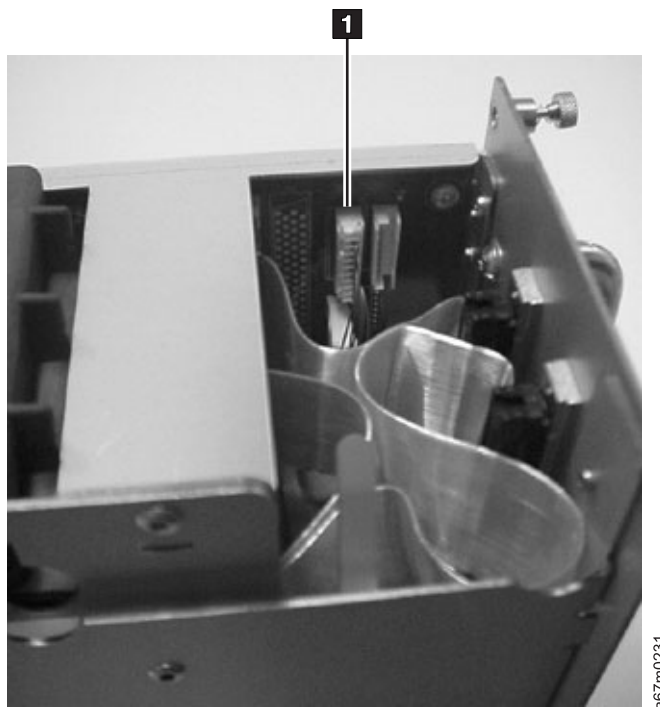


Figure 121. Unplugging the 422 Cable

- ___ 3. Turn the drive sled upside down.
- ___ 4. Remove the four screws (see **1** in Figure 122).

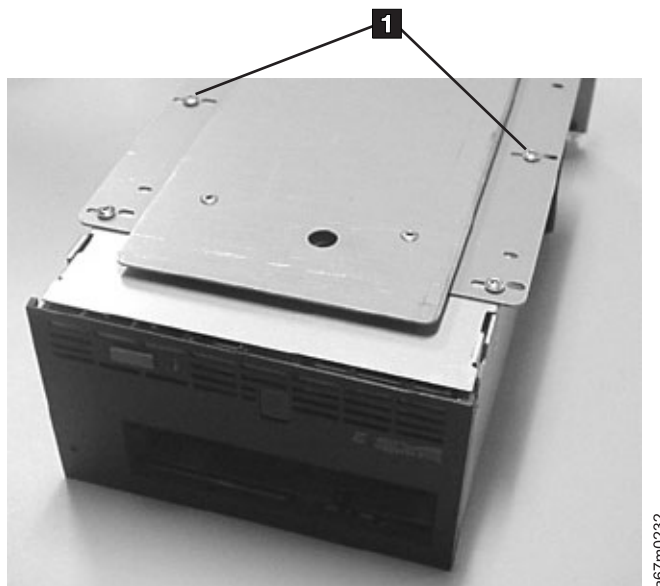


Figure 122. Removing the Four Screws

- ___ 5. Holding both the drive and the drive sled, rotate them to an upright position.
- ___ 6. Being careful to ensure that the 422 cable is guided over the rubber shroud, slowly pull out the drive far enough to disconnect the power **1** and SCSI cables **2** from the rear of the drive (see Figure 123 on page 281).

Note: If you have a HVD drive you will need to unplug the SCSI cable from the converter card, which is located on the back of the drive.

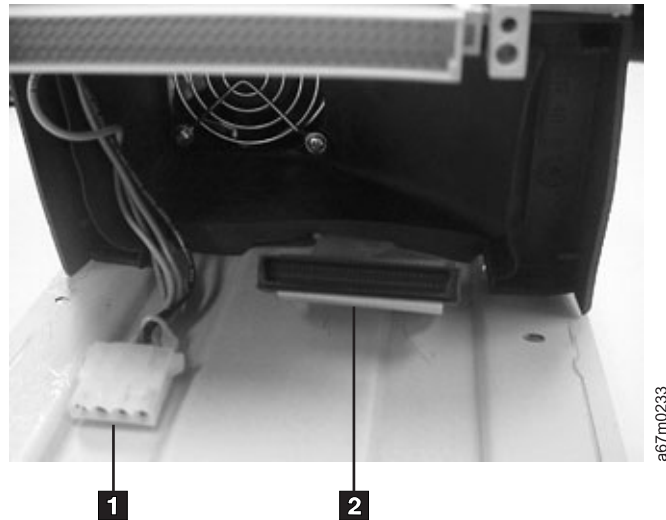


Figure 123. Unplugging Power and SCSI Cables

- ___ 7. Continue sliding the drive forward, making sure that the 422 cable remains attached to the drive. The drive is now ready for the following procedure.

Reinstalling a Drive on the Drive Sled

In reverse order, perform the procedures in “Removing the Drive from the Drive Sled” on page 298.

Note: Ensure that you align the drive on the drive sled using the scribed lines shown in Figure 120 on page 279.

Manually Removing a Tape Cartridge

The purpose of this section is to assist you in determining the condition of the cartridge or the magnetic tape and to direct you to the procedure you must follow to remove the cartridge.

Attention

- Before using this procedure, you must have exhausted all other means of removing the tape cartridge from the drive. Use this procedure **only** if you cannot remove the tape cartridge by using any other means.
- Determine from the customer if the cartridge contains **critical customer data**. If the cartridge contains sensitive data that cannot leave the site, inform the customer that certain failure conditions diagnostics will be performed to test the drive for continued use.
- The following removal procedures **can destroy** customer data! Use **extreme care** when handling or removing the customer's tape cartridges to minimize tape damage and lost data.
- **DO NOT TOUCH** the magnetic tape or tape path. Both are extremely sensitive to the oil and salt from your skin. Use clean, lint-free gloves when working around magnetic tape or the tape path components.
- Electrostatic-sensitive components: Consider using an ESD Kit.
- After you remove the tape cartridge, advise the customer to copy the data to another cartridge and to remove this tape cartridge from service.
- Do not use power tools or magnetic tools to perform this procedure.
- To avoid contamination and electrostatic-discharge damage to the drive, never touch the head or electronic components inside the drive.
- If you cannot remove the cartridge from the drive using the following procedures, contact your next level of support.

Before You Begin

1. If you have not already done so, attempt to remove the cartridge with the device power ON and using library manager, a host application, or the Unload Button.
2. If you have not already done so, attempt to remove the cartridge by power cycling the drive. Look for the drive to attempt a mid-tape recovery.

Note: It can take as long as five minutes for the cartridge to rewind and unload.

3. If the cartridge unloads, inform the operator that the cartridge is unloaded. If the cartridge does not unload, continue with this procedure.

Recommended Tools

- 2.5 mm offset hex wrench (do not use magnetized wrench)
- #1 Phillips screwdriver
- ESD Kit
- Flashlight (optional)
- #1 Flathead screwdriver (optional)

Beginning Procedure

- ___ 1. Refer to the enclosure documentation for instructions on removing the drive.
- ___ 2. Place the drive on a non-slip, sturdy work surface.
- ___ 3. Ground yourself to the drive by using an ESD Kit.
- ___ 4. Remove the cover of the drive by performing the following steps:

- a. Using a Phillips screwdriver, remove the three screws and washers (see **1** in Figure 124) that secure the bezel **2** to the internal drive, then remove the bezel.
- b. Remove the cover of the internal drive by performing the following steps:
 - 1) Remove the four cover-mounting screws and washers **3**.
 - 2) Remove the cover by lifting it up.

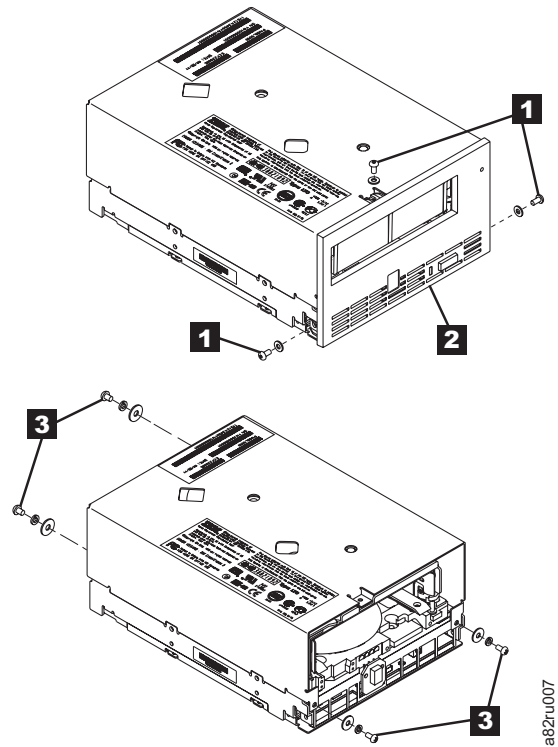


Figure 124. Removing the cover from the internal drive

- ___ 5. Inspect the drive to decide which of the following conditions most closely matches the symptom on the drive:
- **Tape spooled off the supply reel** - All the tape appears to be on the take up reel and no tape is on the supply reel (inside the cartridge). Test the drive after the procedure is completed.
 - **Tape pulled from leader pin (or broken at the front end)** - All the tape appears to be on the supply reel (inside the cartridge) and very little or no tape appears to be on the take up reel. The leader block is positioned in the take up reel. Return the drive after the procedure is completed.
 - **Tape broken in mid-tape** - Tape appears to be on both the supply reel (inside the cartridge) and take up reel. Test the drive after the procedure is completed.
 - **Tape tangled along tape path** - Tape appears to be tangled and damaged but in tact. Return the drive after the procedure is completed.
- OR --
- No damage to tape (or no apparent failure)** - There appears to be no damage or slack to the tape. Return the drive after the procedure is completed.

Tape Spooled off Supply Reel

- 1. With the front of the drive facing you, pull an arm's length of tape out of the take up reel from the left side of the drive.
- 2. From the take up reel, thread tape around the rear of the tape path and over the head rollers on the left side of the drive.
- 3. Set the drive on its left side with the head and tape path facing up.
- 4. Moisten a cotton swab with water and wet approximately 13 mm (0.5 in.) of the tape end and feed it onto the supply reel (inside the cartridge).
- 5. From the bottom of the drive, insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle.

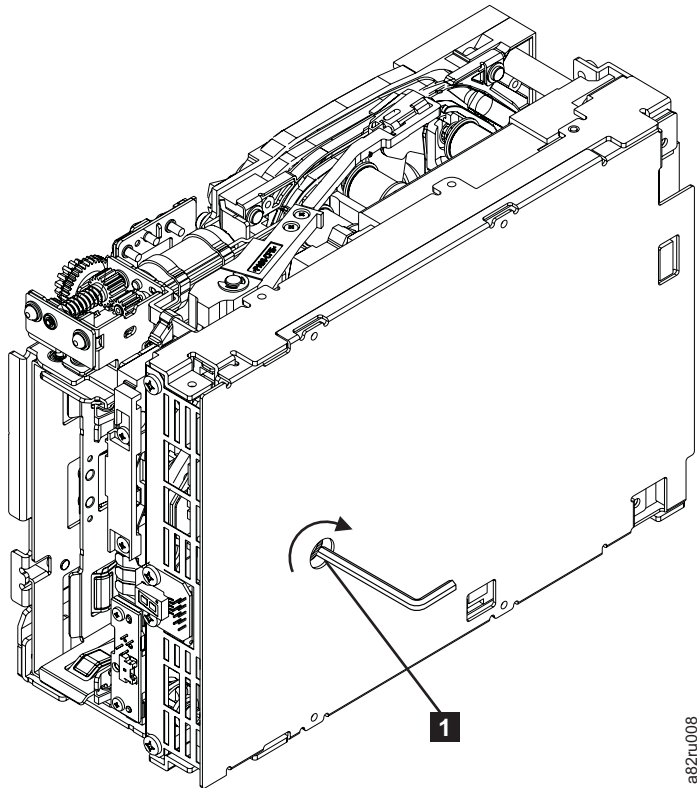


Figure 125. Using hex wrench to rewind tape into cartridge

- 6. Turn the supply reel clockwise, allowing the moistened tape to adhere to the hub as it winds around the supply reel (inside the cartridge).
- 7. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
- 8. Reassemble the drive, reversing the steps in “Beginning Procedure” on page 282.
- 9. Allow the drive to perform mid-tape recovery. This takes several minutes. When this activity completes, the cartridge ejects automatically.
- 10. Test the drive (see “Drive Maintenance Test” on page 155) to determine if it should be replaced.

Tape Pulled from or Broken near Leader Pin

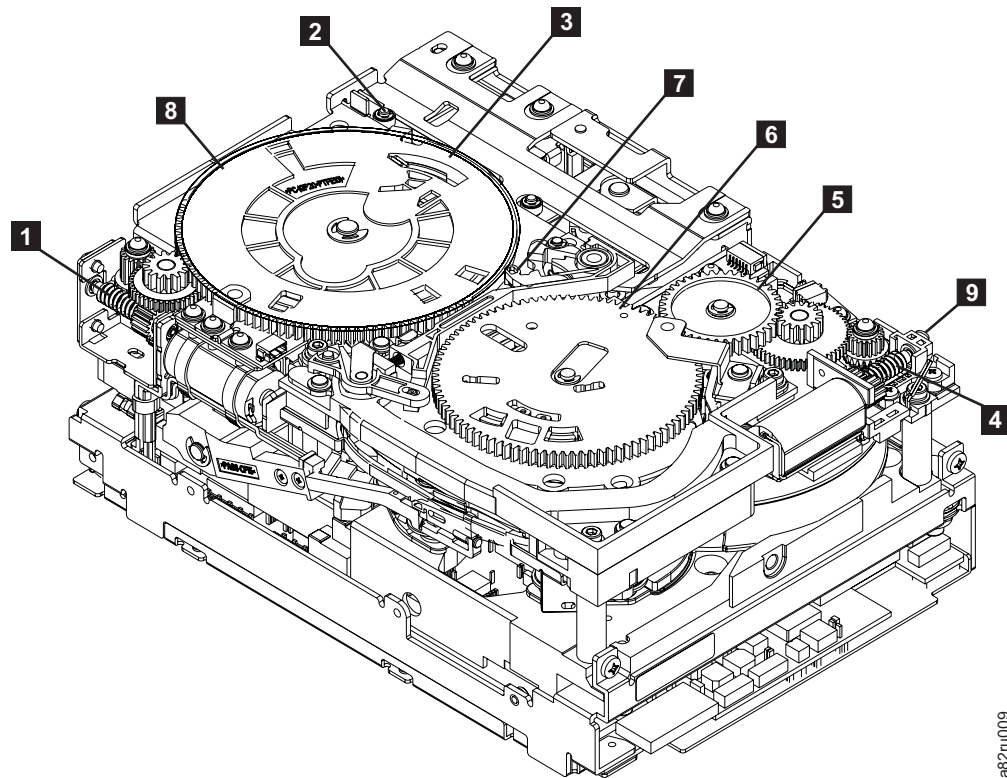


Figure 126. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear	9	Threader worm gear
5	Threader intermediate gear		

- ___ 1. From the left side of the drive, pull out tape from the take up reel.

Note: If there is more than approximately 0.6 m (2 ft.) of tape on the take up reel, go to "Tape Broken in Mid-tape" on page 288.

- ___ 2. If there is less than approximately 0.6 m (2 ft.) of tape on the take up reel, cut off the excess tape as close to the leader pin, as possible.
- ___ 3. Locate the threader motor worm gear (**4** in Figure 126) the rear of the drive. You can either:
 - a. Use your finger to rotate the threader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 126) clockwise; or
 - b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure 126) clockwise.

This rotates the threader motor worm gear (**4** in Figure 126) clockwise, drawing the tape leader block assembly (LBA) into the cartridge.

- ___ 4. As the LBA is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (**4** in Figure 126 on page 286) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 142 on page 302.

- ___ 5. Notice the following:
 - a. Loader mechanism gear (**8** in Figure 126 on page 286) nearest the front of the drive that actuates the cartridge loader mechanism
 - b. Position of the rotator stub (**3** in Figure 126 on page 286).
 - c. Front loader motor worm gear (**1** in Figure 126 on page 286). Rotating this gear allows the loader mechanism gear (**8** in Figure 126 on page 286) to turn.
- ___ 6. Rotate the loader motor worm gear (**1** in Figure 126 on page 286) to turn the loader mechanism gear (**8** in Figure 126 on page 286) counterclockwise. Continue turning until the rotator stub (**3** in Figure 126 on page 286) loses contact with the lever (**7** in Figure 126 on page 286). This releases the LBA leader pin.
- ___ 7. Rotate the threader motor worm gear (**4** in Figure 126 on page 286) to turn the threader mechanism gear (**6** in Figure 126 on page 286) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive (**1** in Figure 127).

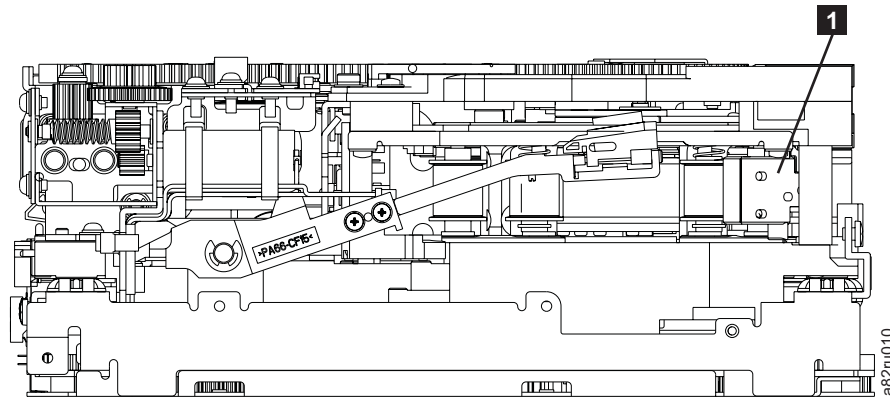


Figure 127. Leader Block Assembly (LBA)

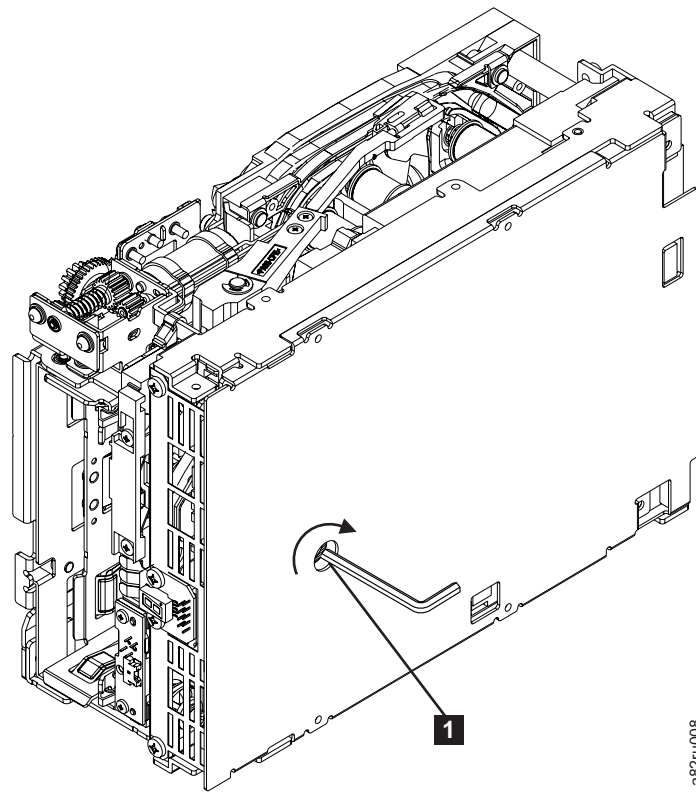
- ___ 8. Continue rotating the loader motor worm gear (**1** in Figure 126 on page 286) until the rotator stub (**3** in Figure 126 on page 286) is positioned as shown. Notice that the rotator stub (**3** in Figure 126 on page 286) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 126 on page 286).
- ___ 9. Remove the cartridge from the cartridge loader tray.
- ___ 10. Reassemble the drive by reversing the procedure in Step 4 on page 282 in Beginning Procedure.
- ___ 11. Refer to the appropriate procedure to install the new drive and return the failed drive.

Tape Broken in Mid-tape

- 1. With the front of the drive facing you, pull an arm's length of tape out of the take up reel from the left side of the drive.

Note: If there is less than approximately 5 cm (2 in.) of tape on the take up reel, go to "Tape Pulled from or Broken near Leader Pin" on page 286.

- 2. From the supply reel inside the cartridge, pull approximately 0.3 m (1 ft.) of tape.
- 3. From the take up reel, thread tape around the rear of the tape path and over the head rollers on the left side of the drive.
- 4. Moisten a cotton swab with water, and wet approximately 13 mm (0.5 in.) of the tape end. Overlap the tape ends, loosely mending them together.
- 5. Set the drive on its left side with the head and tape path facing up.
- 6. From the bottom of the drive, locate the access hole (**1** in Figure 128) in the bottom cover. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. begin spooling tape back into the cartridge by turning the hex wrench clockwise.



a82ru008

Figure 128. Using hex wrench to rewind tape into cartridge

- 7. Turn the supply reel clockwise, carefully guiding the mended portion of the tape to wind around the hub of the supply reel located inside the cartridge. Continue spooling into the cartridge until the tape is taut. The tape must remain within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
- 8. Reassemble the drive by reversing the procedure in Step 4 on page 282 in Beginning Procedure.

- ___ 9. Allow the drive to perform mid-tape recovery. This takes several minutes. When this activity completes, the cartridge ejects automatically.
- ___ 10. Test the drive (see “Drive Maintenance Test” on page 155) to determine if it should be replaced.

Tape Tangled along Tape Path

- ___ 1. Carefully pull out excess tape and untangle.

Note: If you find the tape to be broken, go to one of the following appropriate procedures:

- “Tape Spooled off Supply Reel” on page 285
- “Tape Pulled from or Broken near Leader Pin” on page 286

--OR--

“Tape Broken in Mid-tape” on page 288

- ___ 2. Set the drive on its left side with the head and tape path facing up.

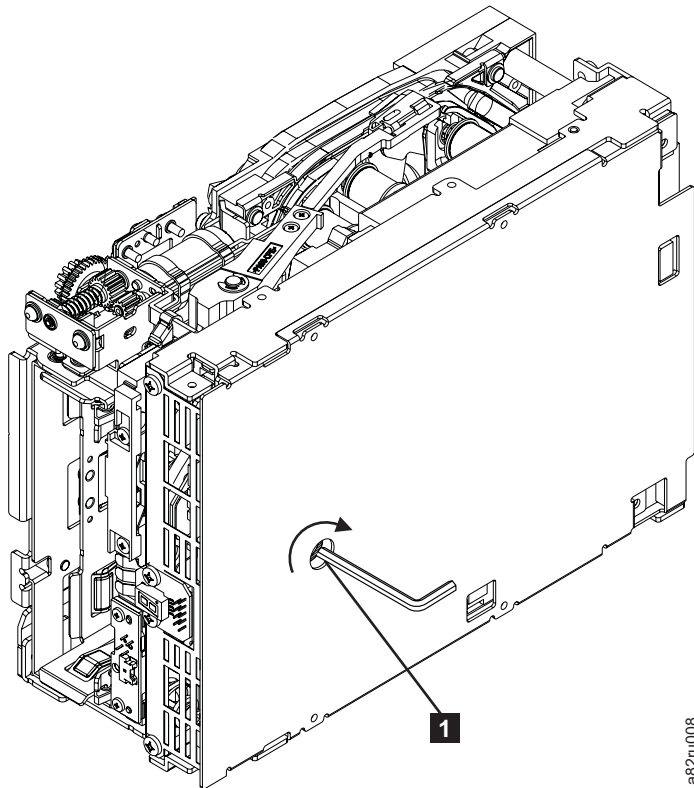


Figure 129. Using hex wrench to rewind tape into cartridge

- ___ 3. From the bottom of the drive, locate the access hole (**1** in Figure 129).
- ___ 4. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling the tape back into the cartridge by turning the hex wrench clockwise.
- ___ 5. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
- ___ 6. Locate the threader motor worm gear (**4** in Figure 130 on page 290) on the rear of the drive. You can either:

- a. Use your finger to rotate the treader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 130) clockwise; OR
- b. Use a #1 flathead screwdriver to turn the worm gear (**9** in Figure 130) clockwise.

This rotates the threader motor worm gear (**4** in Figure 130) clockwise, drawing the LBA into the cartridge.

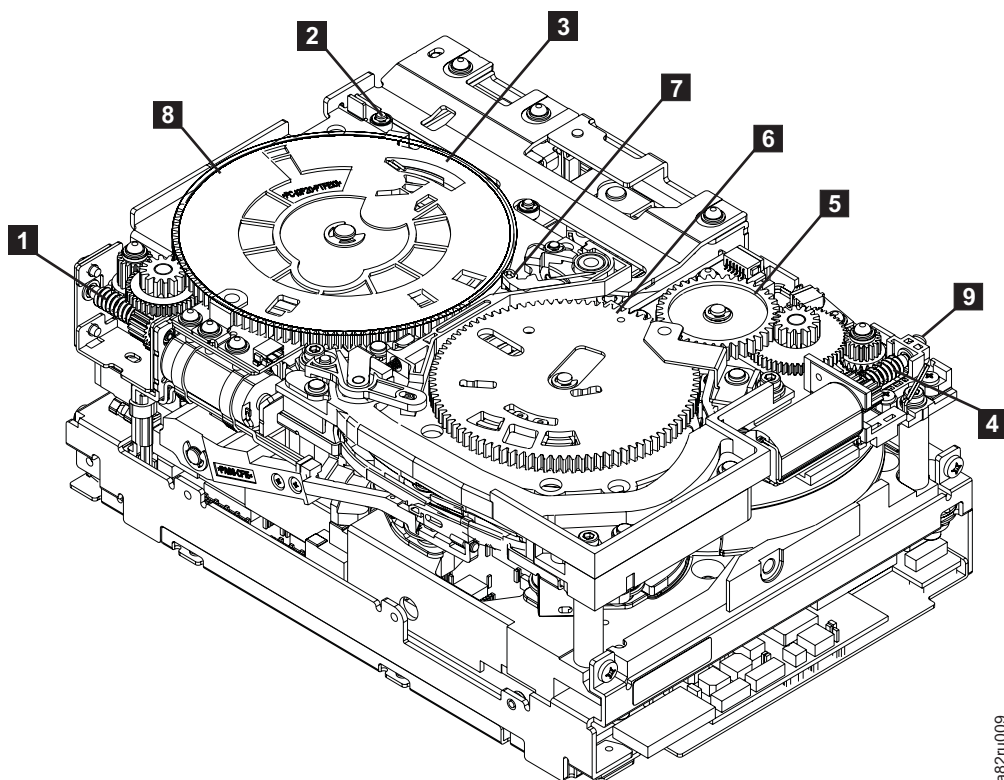


Figure 130. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear	9	Threader worm gear
5	Threader intermediate gear		

- 7. As the tape leader block assembly (LBA) is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (**4** in Figure 130) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 129 on page 289.

- 8. Notice the:
 - a. Loader mechanism gear (**8** in Figure 130) nearest the front of the drive that actuates the cartridge loader mechanism.

- b. Position of the rotate stub (**3** in Figure 130 on page 290).
- c. Front loader motor worm gear (**1** in Figure 130 on page 290). Rotating this gear allows the loader mechanism gear (**8** in Figure 130 on page 290) to turn.
- ___ 9. Rotate the loader motor worm gear (**1** in Figure 130 on page 290) to turn the threader mechanism gear (**6** in Figure 130 on page 290) counterclockwise. Continue turning until the rotator stub (**3** in Figure 130 on page 290) loses contact with the lever (**7** in Figure 130 on page 290). This releases the LBA leader pin.
- ___ 10. Rotate the threader motor worm gear (**4** in Figure 130 on page 290) to turn the threader mechanism gear (**6** in Figure 130 on page 290) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive shown as **1** Figure 131.

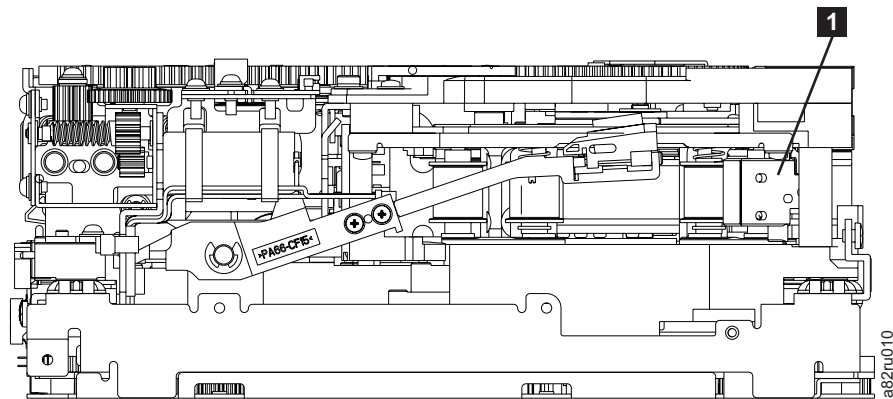


Figure 131. Leader Block Assembly (LBA)

- ___ 11. Continue rotating the loader motor worm gear (**1** in Figure 130 on page 290) until the rotator stub (**3** in Figure 130 on page 290) is positioned as shown. Notice that the rotator stub (**3** in Figure 130 on page 290) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 130 on page 290).
- ___ 12. Remove the cartridge from the cartridge loader tray.
- ___ 13. Reassemble the drive by reversing the procedure in Step 4 on page 282 in Beginning Procedure.
- ___ 14. Refer to the appropriate procedure to install the new drive and return the failed drive.

No Apparent Failure or Damage to Tape

1. Set the drive on its left side with the head and tape path facing up.

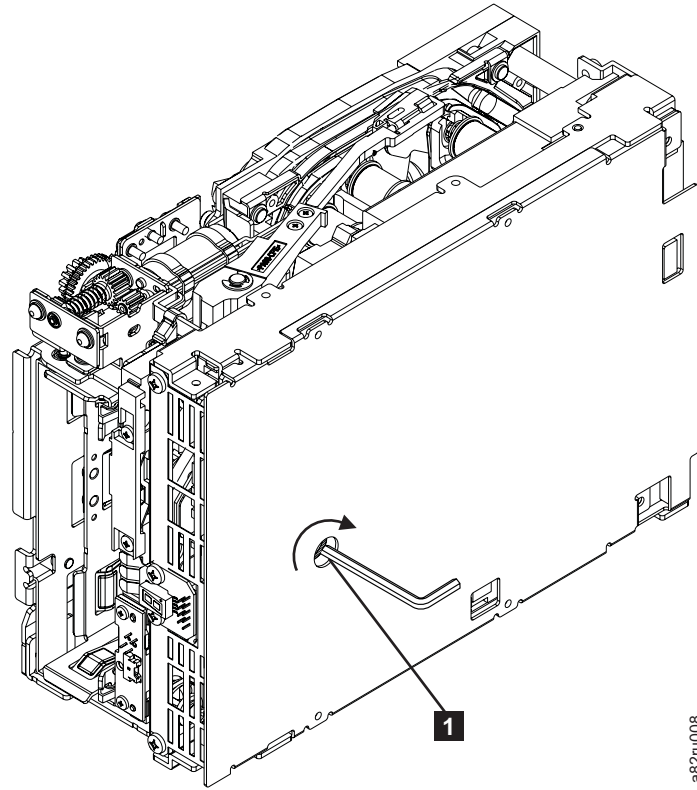


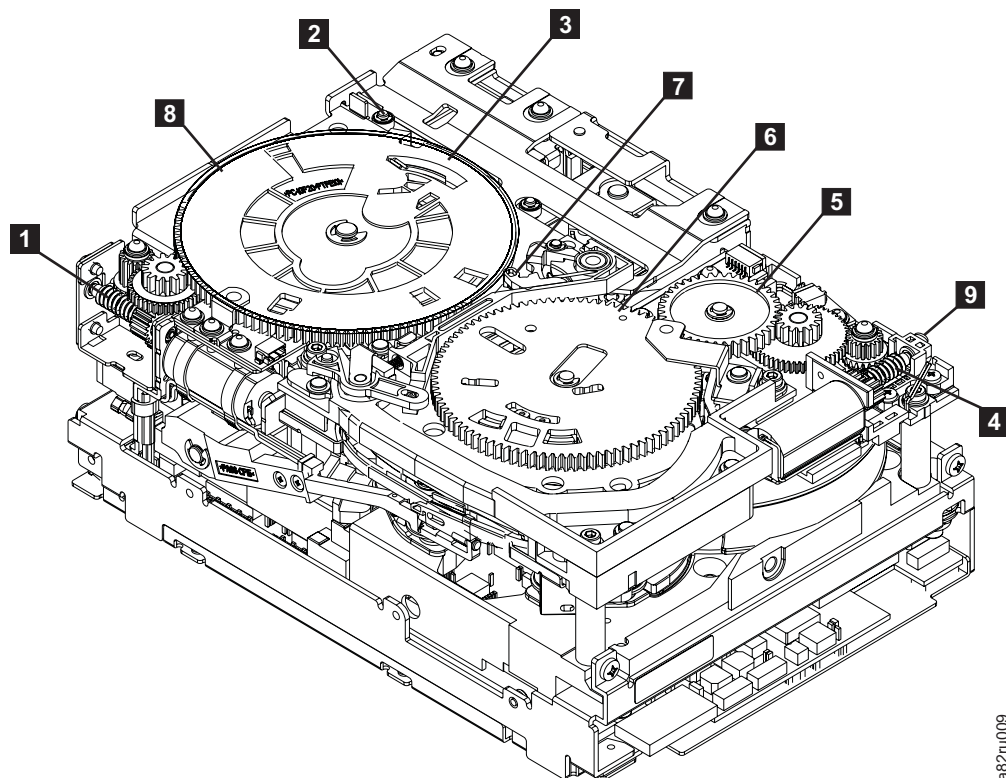
Figure 132. Using hex wrench to rewind tape into cartridge

2. From the bottom of the drive, locate the access hole (**1** in Figure 132).
3. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling the tape back into the cartridge by turning the hex wrench clockwise.
4. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
5. Locate the threader motor worm gear (**4** in Figure 133 on page 293) on the rear of the drive. You can either:
 - a. Use your finger to rotate the threader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 133 on page 293) clockwise;

--OR--

 - b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure 133 on page 293) clockwise.

This rotates the threader motor worm gear (**4** in Figure 133 on page 293) clockwise, drawing the LBA into the cartridge.



a82u009

Figure 133. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear	9	Threader worm gear
5	Threader intermediate gear		

- 6. As the tape leader block assembly (LBA) is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (**4** in Figure 133) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 129 on page 289.

- 7. Notice the:
 - a. Loader mechanism gear (**8** in Figure 133) nearest the front of the drive that actuates the cartridge loader mechanism.
 - b. Position of the rotate stub (**3** in Figure 133).
 - c. Front loader motor worm gear (**1** in Figure 133). Rotating this gear allows the loader mechanism gear (**8** in Figure 133) to turn.
- 8. Rotate the loader motor worm gear (**1** in Figure 133) to turn the threader mechanism gear (**6** in Figure 133) counterclockwise. Continue turning until the rotator stub (**3** in Figure 133) loses contact with the lever (**7** in Figure 133). This releases the LBA leader pin.

- ___ 9. Rotate the threader motor worm gear (**4** in Figure 133 on page 293) to turn the threader mechanism gear (**6** in Figure 133 on page 293) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive shown as **1** Figure 134.

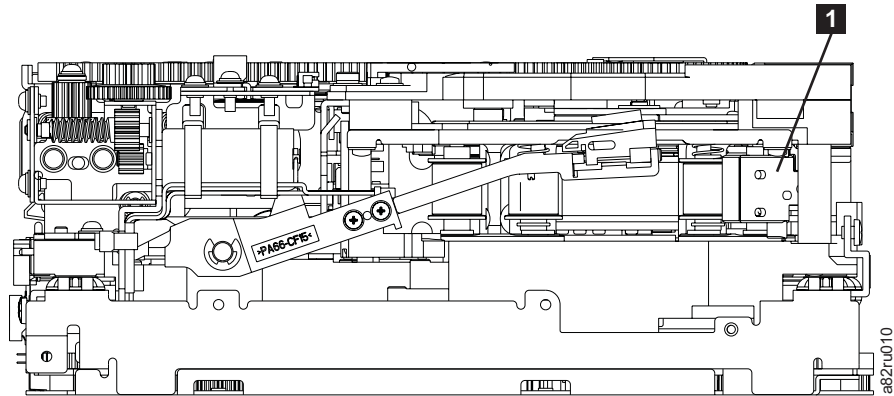


Figure 134. Leader Block Assembly (LBA)

- ___ 10. Continue rotating the loader motor worm gear (**1** in Figure 133 on page 293) until the rotator stub (**3** in Figure 133 on page 293) is positioned as shown. Notice that the rotator stub (**3** in Figure 133 on page 293) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 133 on page 293).
- ___ 11. Remove the cartridge from the cartridge loader tray.
- ___ 12. Reassemble the drive by reversing the procedure in Step 4 on page 282 in Beginning Procedure.
- ___ 13. Refer to the appropriate procedure to install the new drive and return the failed drive.

Manually Removing a Tape Cartridge from an Ultrium 2 Tape Drive

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 cartridge will void your warranty.

Removing the Cartridge

If a cartridge fails to eject from an library, 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 or T10 Torx

Attention

Before performing this procedure, note the following:

- Ensure that you have attempted all normal methods of removing the cartridge from the drive. Refer to “Resetting the Drive and Ejecting the Cartridge” on page 277.
- This procedure may damage the stuck 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 174. If you believe the cartridge has been damaged, replace it.
- If you use a power screwdriver to perform this procedure it could destroy the cartridge.
- Never touch the head or electronic components within the drive. Touching may cause contamination or damage by electrostatic discharge.

To manually remove a cartridge, perform the following steps:

1. Vary the library Offline to ALL ATTACHED HOSTS.
2. Power off the library. The power switch is located on the front of the library.
3. Disconnect all cables to the drive sled that contains the stuck cartridge.
4. Loosen the four captive thumbscrews **1** (see Figure 135 on page 296) on the drive sled and slide the drive sled out using the handle **2** (see Figure 135 on page 296).

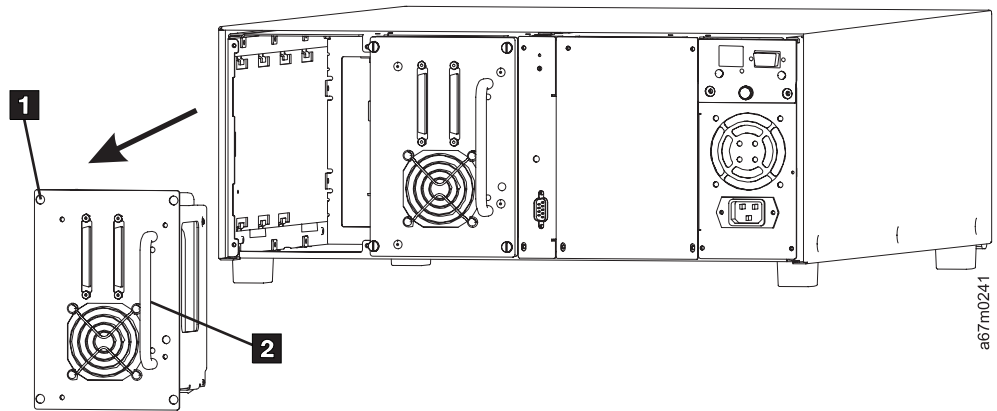


Figure 135. Removing the Drive Sled

- 5. Place the drive sled so the front of the drive faces you.
- 6. Locate the access hole at the bottom of the unit **1** in Figure 136.
- 7. Insert a 2.5-mm allen wrench into the access hole **1** in Figure 136 and position the wrench so it is seated in the screw of the supply reel motor (not visible).
- 8. Push open the door of the cartridge load compartment and locate the flag **2** in Figure 136 on the drive's takeup reel.

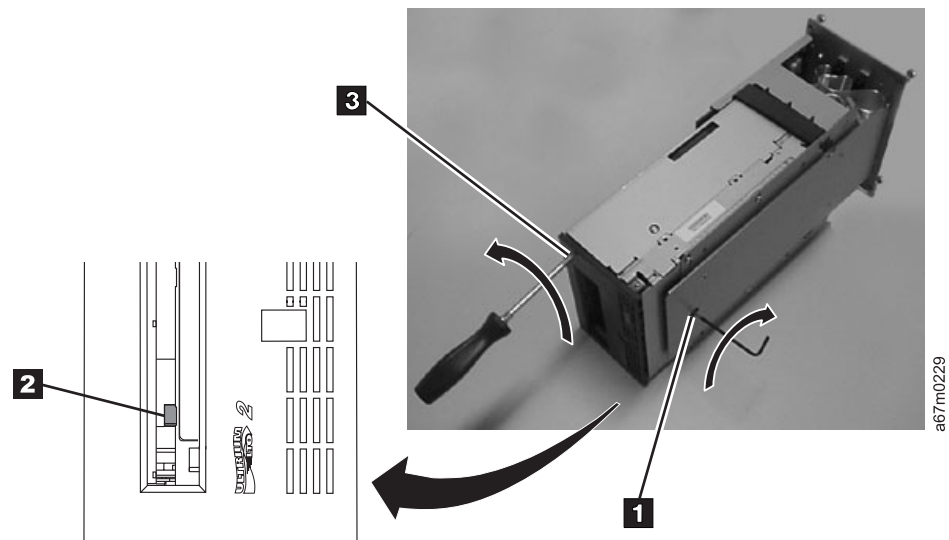


Figure 136. Determining whether the tape is broken. The view is from the front of the drive.



Attention: In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the cartridge.

- 9. To determine whether the tape is broken, watch the flag **2** in Figure 136 on the drive's takeup reel while you rotate the allen wrench **1** in Figure 136 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 11 on page 297.

- 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 10.
 - If the takeup reel does not turn when you rotate the supply reel motor screw clockwise with the allen wrench and if 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** in Figure 136 on page 296. 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. Contact your IBM Service Representative to perform the procedure in “Fixing an Internal Jam” on page 298.
- ___ 10. 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 rotations required depends on where the beginning of the tape is on the take up reel. You may have to rotate the allen wrench for a lengthy period.
- ___ 11. 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** (see Figure 136 on page 296).
- ___ 12. While keeping torque on the supply reel motor screw and rotating the allen wrench **1** (see Figure 136 on page 296) clockwise, rotate the loader motor gear with the small-blade screwdriver **3** (see Figure 136 on page 296) counterclockwise (see arrow). As you rotate the screwdriver, the allen wrench moves slightly.
- ___ 13. 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 cartridge load compartment, the procedure was successful. Go to step 14.
 - 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 contact your IBM Service Representative to perform the procedure in “Fixing an Internal Jam” on page 298.
- ___ 14. Remove the cartridge. If the leader pin is not seated correctly in the cartridge, see “Repositioning or Reattaching a Leader Pin” on page 174.
- ___ 15. Copy the data on the jammed cartridge to another cartridge. After you remove the jammed cartridge, set it aside and copy it at a later time. Discard the cartridge after you have recovered data from it.
- ___ 16. Slide the drive sled into slot you removed it from using the handle **2** (see Figure 135 on page 296). Tighten the four captive thumbscrews **1** (see Figure 135 on page 296) on the drive sled. See “Replacing a Drive” on page 209.
- ___ 17. Connect the SCSI cables that were disconnected in step 3 on page 295.
- ___ 18. Power on the library.
- ___ 19. Vary the library and drives online to ALL ATTACHED HOSTS.

Fixing an Internal Jam

Attention:

This procedure must be performed only by trained service personnel.

If problem-determination procedures identify the Ultrium Tape Drive as the source of a problem, replace the entire unit. 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 cartridge will void your warranty.

Before performing this procedure, ensure that you have completed the steps that begin on page “Manual Removal of Tapes” on page 201. Do not attempt this procedure until you have completed these steps.

Removing the Drive from the Drive Sled

Attention

It is critical to maintain the alignment of the drive on the drive sled.

1. Carefully scribe a line on the drive sled on each side of the drive to mark the drive position on the sled. See Figure 137.



Figure 137. Scribing

2. Unplug the RS422 cable from the rear of the drive sled. See **1** in Figure 138 on page 299.

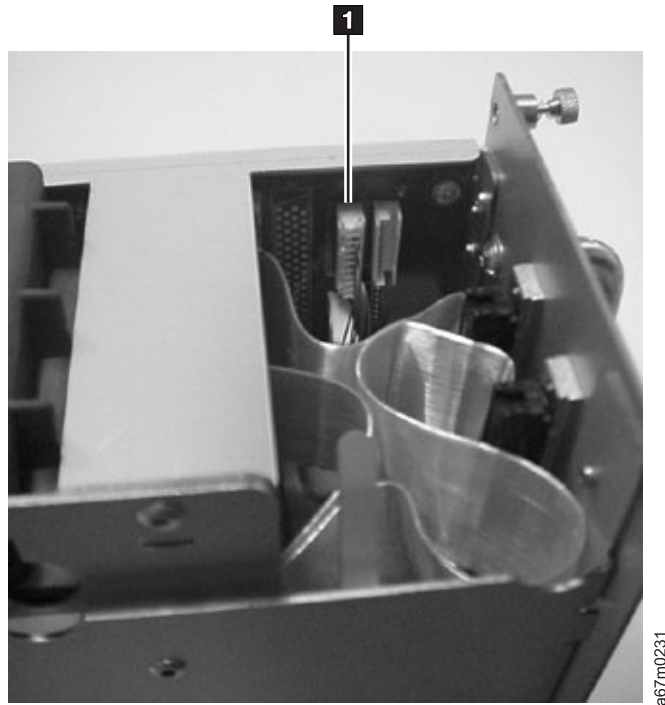


Figure 138. Unplugging the 422 Cable

- ___ 3. Turn the drive sled upside down.
- ___ 4. Remove the four screws (see **1** in Figure 139).

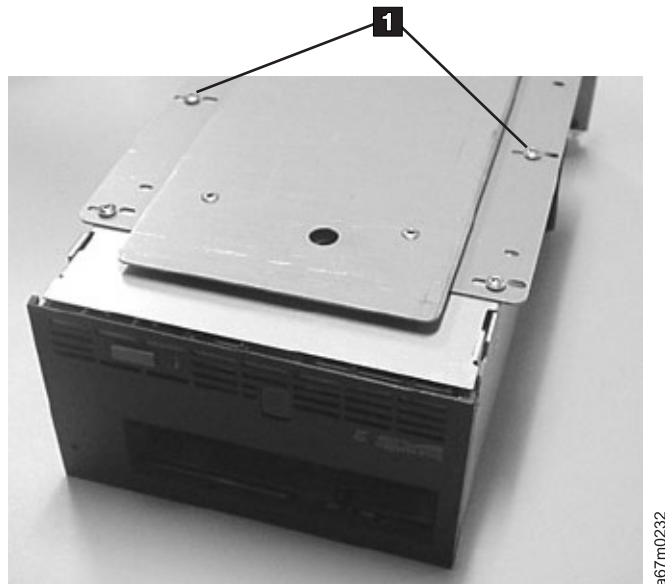


Figure 139. Removing the Four Screws

- ___ 5. Holding both the drive and the drive sled, rotate them to an upright position.
- ___ 6. Being careful to ensure that the 422 cable is guided over the rubber shroud, slowly pull out the drive far enough to disconnect the power **1** and SCSI cables **2** from the rear of the drive (see Figure 140 on page 300).

Note: If you have a HVD drive you will need to unplug the SCSI cable from the converter card, which is located on the back of the drive.

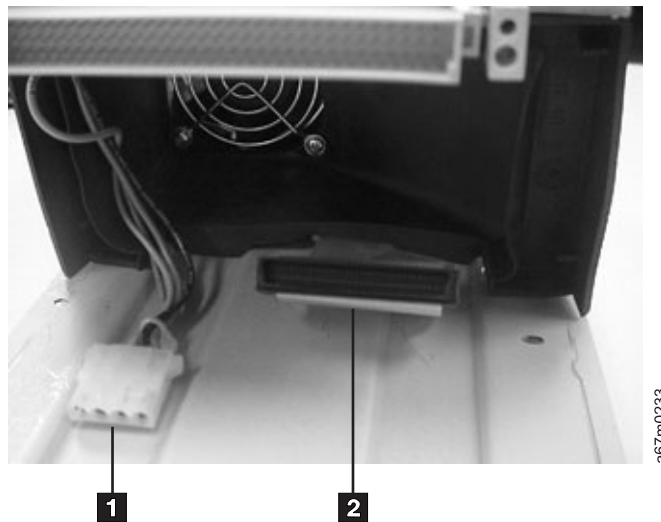


Figure 140. Unplugging Power and SCSI Cables

- ___ 7. Continue sliding the drive forward, making sure that the 422 cable remains attached to the drive. The drive is now ready for the following procedure.

Reinstalling a Drive on the Drive Sled

In reverse order, perform the procedures in “Removing the Drive from the Drive Sled” on page 298.

Note: Ensure that you align the drive on the drive sled using the scribed lines shown in Figure 137 on page 298.

Fixing the Internal Jam

If you have reached this point, the cartridge is broken or the leader pin dropped (or looks like it dropped) from the leader block. To fix these conditions, perform the following procedure.

- ___ 1. Tilt the drive so that its bottom rests on a nonslip surface.
- ___ 2. Remove the cover of the drive by performing the following steps:
 - a. Use an appropriate tool to remove the three screws and washers (see **1** in Figure 141 on page 301) that secure the bezel **2**. Remove the bezel.
 - b. Use a screwdriver to remove the four cover-mounting screws and washers **3**.
 - c. Remove the cover by lifting it up. Set the cover aside.

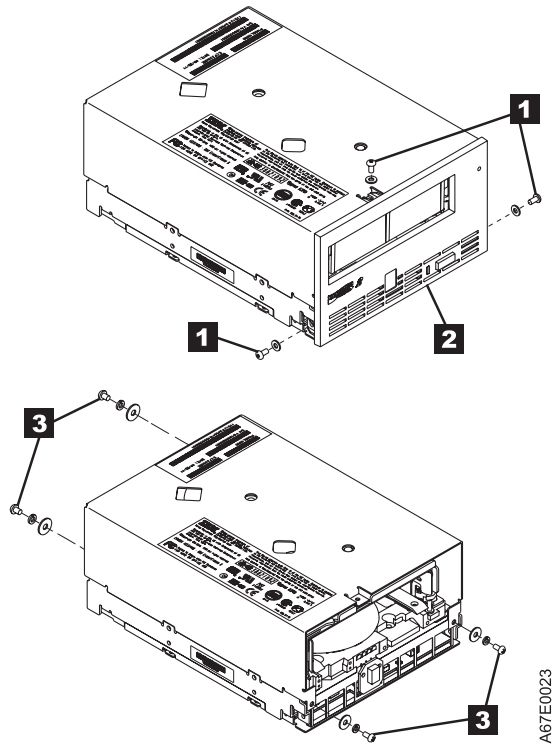


Figure 141. Removing the top cover of the drive

- ___ 3. Examine the drive to determine the cause of the problem:
 - If the cartridge is broken, do not attempt repair. Return the drive and the stuck cartridge to your reseller for maintenance (note that your cartridge will be scrapped).
 - If the leader pin dropped from the leader block, go to step 4 on page 302 and continue this procedure.
 - If the leader block pulled the cartridge (but not the pin) from the spool so that it looks like the pin was dropped, go to step 4 on page 302 and continue this procedure.

- ___ 4. Place the cartridge drive so that the front faces you, then tilt it on its left side (see Figure 142).
- ___ 5. At the bottom of the drive, locate the access hole (**1** in Figure 142).



Attention: In the following steps, do not allow drive components to touch the head **2**. Damage may result to the head.

- ___ 6. 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.

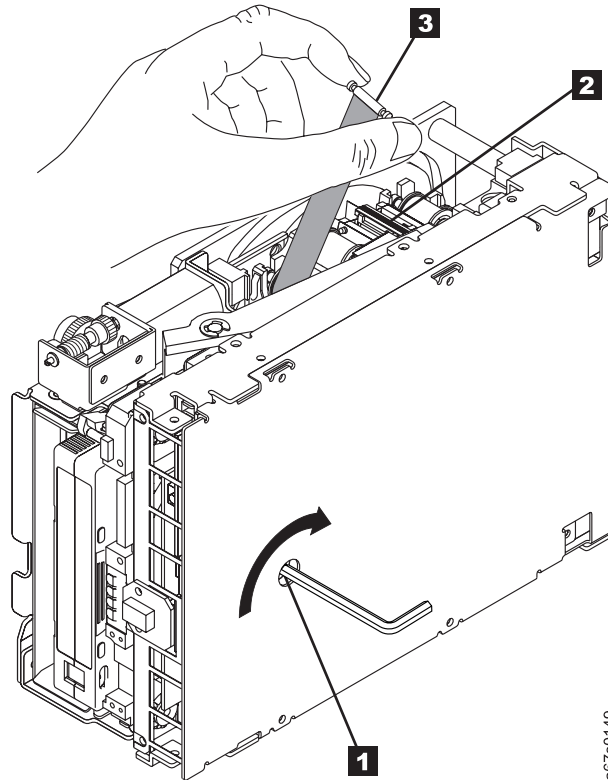


Figure 142. Rewinding the leader pin into the cartridge

- ___ 7. With clean needle-nose pliers, grasp the end of the leader pin and pull it out of the cartridge so that you can grip it with your fingers (see **3** in Figure 142).

Note: If the leader pin is not connected to the cartridge, set the pin aside. After you remove the cartridge, reattach the pin (see “Repositioning or Reattaching a Leader Pin” on page 174).

- 8. While keeping the cartridge taut with your fingers, rotate the allen wrench clockwise **1** to wind the excess cartridge into the cartridge. Guide the leader pin toward the cartridge and drop it inside the cartridge door. Ensure that no cartridge is left outside of the cartridge. Remove the allen wrench.

Note: Do not attempt to seat the leader pin into the cartridge's clips; this will interfere with the motion of the leader block.

- 9. Manually rotate the loader motor gear (see **1** in Figure 143) in the unload direction (counterclockwise) until the leader block **2** reaches the last roller **3**.
- 10. While manually rotating the loader motor gear in the unload direction, guide the end of the leader block **2** into the white guide block **4**.

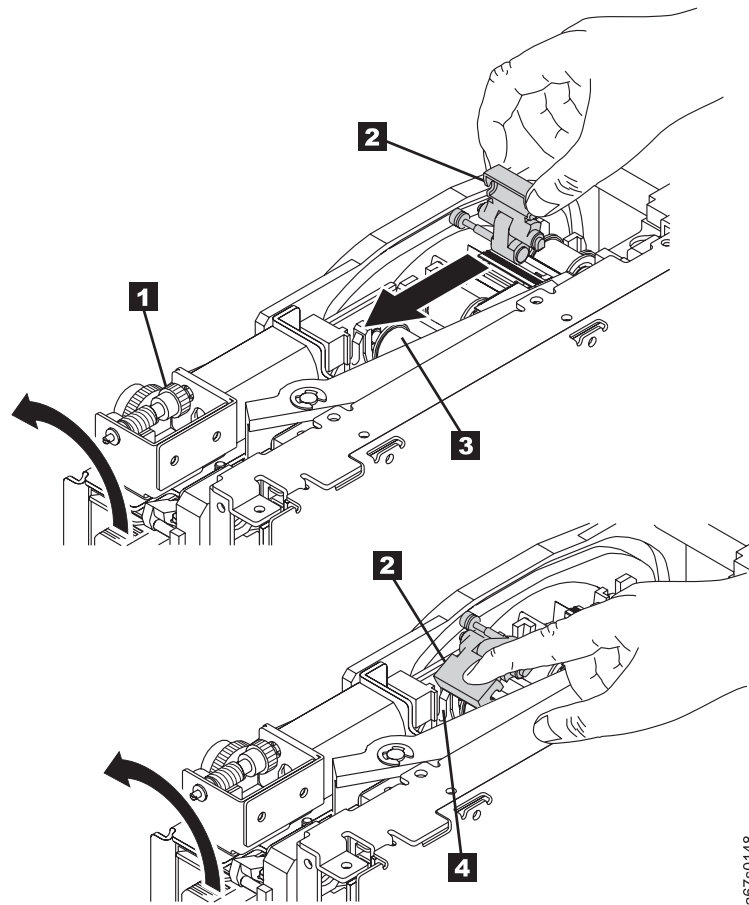


Figure 143. Guiding the leader block into the home position

- ___ 11. Rotate the loader motor gear in the unload direction until the leader block is fully inside the drive (see **1** in Figure 144).

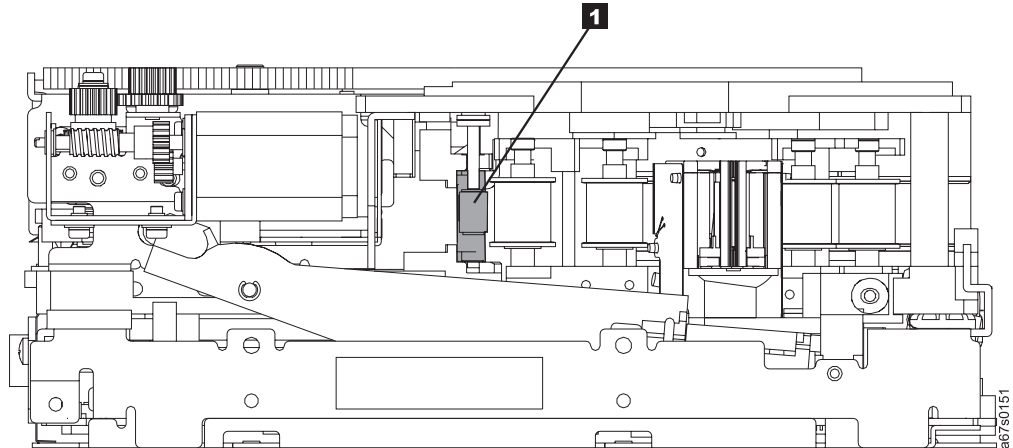


Figure 144. Rotating the loader motor gear until the leader block is fully inside the drive. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

- ___ 12. Continue to rotate the loader motor gear counterclockwise. The leader block retracts and occupies the opening to the drive (see **1** in Figure 145).

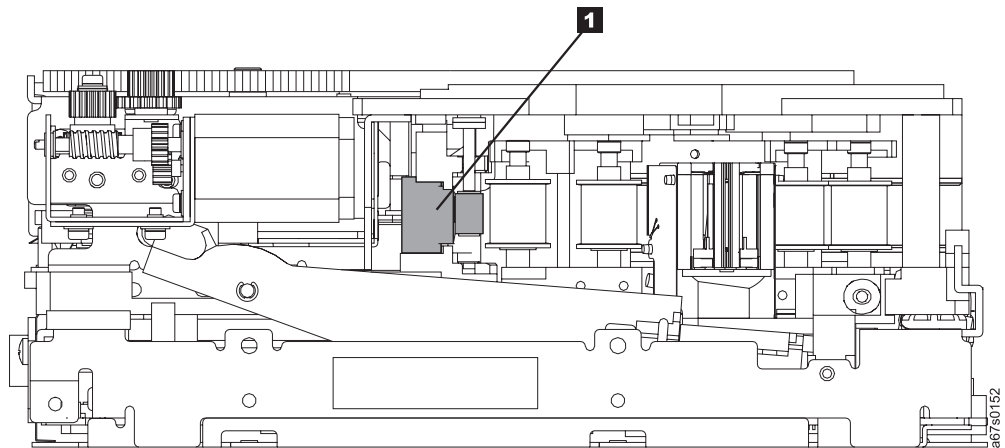


Figure 145. Rotating the loader motor gear so that the leader block retracts. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

- ___ 13. Rotate the loader motor gear counterclockwise until you feel resistance and the cartridge rises and ejects (see Figure 146 on page 305).

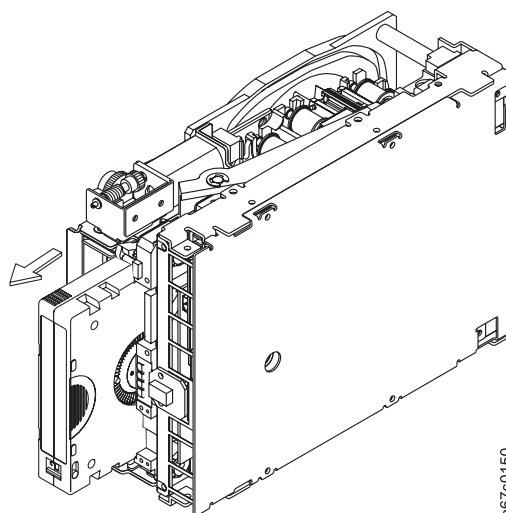


Figure 146. Rotating the loader motor gear until the cartridge ejects

- ___ 14. Remove the cartridge. If the leader pin is not seated correctly in the cartridge, see "Repositioning or Reattaching a Leader Pin" on page 174.
- ___ 15. Copy the data on the stuck cartridge to another cartridge. If appropriate, return the stuck cartridge for analysis in its original packaging or in the packaging from its replacement.
- ___ 16. Reassemble the cartridge drive by reversing the preceding steps.
- ___ 17. See "Reinstalling a Drive on the Drive Sled" on page 300.
- ___ 18. Turn the power switch to the On position (|) to restore power to the cartridge library.
- ___ 19. Ask the customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.
- ___ 20. To ensure that the drive operates properly, see "Drive Maintenance Test" on page 155 to run the Normal Read/Write test.

Appendix G. 3582 Configuration Form

Photocopy this form, complete it during installation, and store it in a secure location in the event that you need to restore your installation settings. Bold is for recommended settings.

Serial Number					
Partition (circle one)	On	Off			
AutoClean (circle one)	On	Off			
Auto Clean Partition (circle one)	N/A	Both	Part 1	Part 2	
AutoClean Slots (circle one)	N/A	1	2	3	4
Partition Slots	Example: 9/15				
Mode (no partitions) (circle one)	Random	Sequential			
Mode (Partition 1) (circle one)	Random	Sequential			
Mode (Partition 2) (circle one)	Random	Sequential			
I/O Slot Configuration (circle one)	Storage	Input/Output			
Drive 1 type	SCSI	Fibre Channel			
Drive 2 type	SCSI	Fibre Channel			
Drive 1 serial number					
Drive 2 serial number					
Drive 1 SCSI ID (circle one)	0 1 2 3	4 5 6 8	9 10 11 12	13 14 15	
Drive 2 SCSI ID (circle one)	0 1 2 3	4 5 6 8	9 10 11 12	13 14 15	
Drive 1 Fibre ID					
Drive 2 Fibre ID					
Inquiry String	ULT3582-TL				
Menu Timeout (minutes)					
Password Function (circle one)	On	Off			
Password					
Key Click (circle one)	On	Off			
Bar Code Scanner (circle one)	On	Off			
Bar Code Scanner Mode (circle one)	Default	Media ID	Extended		
IP Address					
Subnet Mask					
Gateway Mask					
License Key					

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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 conforme 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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vcci

People's Republic of China Class A Electronic Emission Statement

中华人民共和国“A类”警告声明

声明

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居住的環境中使用時，可
能會造成射頻干擾，在這
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taemi

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Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication.

Numbers

2:1 compression. The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression. In 2:1 compression, twice as much data can be stored with compression as can be stored without compression.

IBM TotalStorage 3582 Tape Library. A device that can be attached to a supported server and used to write data to and from magnetic tape.

A

A. Ampere.

AC. Alternating current.

AL_PA. Arbitrated Loop Physical Address

ASCII. American Standard Code for Information Interchange.

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

BPV. Bit Pointer Valid.

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

CD. Compact disc.

C/D. Command/Data.

CSU. Customer Set Up.

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 spring—loaded door 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.

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

DC. Direct current.

DHCP. Dynamic host configuration protocol.

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.

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.

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.

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 data from electrical signals to optical signals.

H

HVD/DIFF. High voltage differential.

Hz. Hertz.

head. See *drive head*.

hertz (Hz). A unit of frequency equal to the number of cycles 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.

host interface board (SCSI). need definition

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.

ID. Identifier.

I/O. Input/Output.

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

KB. Kilobyte. 2 to the power of 10 or 1024 bytes.

kg. Kilogram.

kilogram (kg). One thousand grams (approximately 2.2 pounds).

L

LAN. Local area network.

LCD. See *liquid crystal display*.

LED. Light-emitting diode.

LSB. Least Significant Byte/Bit.

LPOS. Logical Position.

LTO. See Linear Tape-Open.

LTO-CM. LTO cartridge memory.

LVD. Low-voltage differential.

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.

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.

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 Certance. 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 Accellis 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.

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 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.

M

m. Meter.

MB. Megabyte.

MIB. Management Information Base.

MSB. Most Significant Byte/Bit.

MSBF. Mean Swaps Between Failure

MTBF. Mean time between failure.

MTTR. Mean Time To Repair

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.

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.

N

NVRAM. Non-Volatile Random Access Memory

native data capacity. The amount of data that can be stored without compression on a cartridge.

Non-Volatile Random Access Memory. A type of memory that retains its contents when power is turned off.

| **noncondensing.** The temperature at which water
| vapor does not condense.

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 abampere 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.

PMR. Problem Management Record.

POST. Power-On Self Test.

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.

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

RMU. Remote Management Unit

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.

robotics. The picker and any associated mechanisms that move a tape cartridge within the tape library.

S

SAC. Service Action Code

SAN. Storage area network

SCSI. Small computer systems interface.

SCSI-2. Small computer systems interface-2.

SKSV. Sense Key Sense Value.

SNMP. Simple Network Management Protocol.

scratch cartridge. A data cartridge that contains no useful data, but can be written to with new data.

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.

Small Computer Systems Interface-2 (SCSI-2). See *Small Computer Systems Interface (SCSI)*.

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

TB. Terabyte.

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*.

teach. A process where the bar code scanner 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

URL. Uniform resource locator.

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.

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.

| **WORM (Write Once, Read Many).** WORM is a
| special method for storing data on tape. This data
| storage method is required by certain applications, such
| as archiving and data retention, as well as those
| applications requiring an audit trail. WORM capability
| is available on LTO Ultrium 3 drives. The requirements
| for enabling WORM capability include
| WORM-compatible drive firmware and a special
| WORM tape cartridge.

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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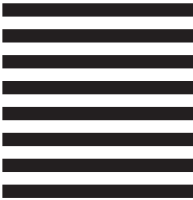
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