

IBM TotalStorage
3583 Tape Library



Maintenance Information for Multi-Path Libraries

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Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page D-1.

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The revision character I found in this document identifies the information that has been added or changed.

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Preface

This guide contains information and instructions necessary for the installation and service of the IBM TotalStorage 3583 Tape Library. Throughout this guide, references to the *tape library* or *library* will mean the IBM TotalStorage 3583 Tape Library.

Intended Audience

This guide is intended for trained service personnel who install and repair the tape library.

Organization

This guide contains the following information.

- Chapter 1, “Introduction,” on page 1-1 describes the contents of this guide, as well as provides a description of the tape library and its functions.
- Chapter 2, “Safety Instructions,” on page 2-1 gives general safety procedures.
- Chapter 3, “User Interfaces,” on page 3-1 provides a description of the Operator/CE Panel and RMU.
- Chapter 4, “Operating Procedures,” on page 4-1 describes menus available via the Operator/CE Panel and the RMU.
- Chapter 5, “Start,” on page 5-1 provides a starting point for all maintenance actions.
- Chapter 6, “Fault Symptom Index,” on page 6-1 provides all service actions for reported symptoms.
- Chapter 7, “Locations,” on page 7-1 provides information to locate major components in the library.
- Chapter 8, “Check, Adjust, Remove, and Replace,” on page 8-1 provides procedures for making checks, adjustments, removals and replacements of field replaceable units.
- Chapter 9, “Service Procedures,” on page 9-1 provides common service procedures for the library.
- Chapter 10, “Messages,” on page 10-1 gives information about obtaining tape drive error information at the host or from RS/6000®, AS/400®, Sun, and HP-UX systems.
- Chapter 11, “Sense,” on page 11-1 provides sense information about the tape library and the Ultrium Tape Drives.
- Chapter 12, “Power,” on page 12-1 provides power distribution diagram for the library.
- Chapter 13, “Cable,” on page 13-1 provides cable diagrams for the library.
- Chapter 14, “Installation,” on page 14-1 gives steps on installing the library.
- Chapter 15, “Parts List,” on page 15-1 lists FRU numbers for the parts in the library and provides power cord information for different countries (or regions).
- “TapeAlert Flags” on page A-1 lists TapeAlert flags that the tape library and the Ultrium Tape Drive support.
- “Removing a Tape Cartridge” on page B-1 provides information for removing a tape cartridge from an Ultrium Tape Drive.
- “Element Addressing” on page C-1 shows element addressing information for the drives and storage slots in the tape library.

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/1to> .

- *IBM TotalStorage 3583 Tape Library SCSI Reference*, GA32-0453, provides supported SCSI commands and protocol governing the behavior of SCSI interface for the tape library.
- *IBM TotalStorage 3583 Tape Library Quick Reference*, GX35-0557, illustrates how to install and operate the tape library.
- *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*, GA32-0411, provides information for installing and operating the tape library.
- *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*, GA32-0436, provides installation, operation, and service information for the SAN Data Gateway Module.
- *IBM Ultrium Device Driver 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. Also gives requirements for adapter cards, and tells how to configure hosts to use the device driver. All the above are with the Ultrium family of devices.
- *IBM Ultrium Device Driver Programming Reference* , GC-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.

Getting Assistance

If this document does not help you solve your problem, contact your next level of support.

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Description

The IBM® TotalStorage™ Ultrium Scalable Tape Library 3583 is a stand-alone or rack-mounted device that provides reliable, automated tape handling and storage for unattended mid-range systems and network servers. The library handles a wide range of data storage needs, including backup, archiving, software program distribution, automatic data migration between disk storage and tape, and disaster recovery. Cartridges can be mounted and dismounted on tape drives by using supporting software from the server (host) without operator intervention.

The Ultrium Scalable Tape Library is installed with high-performance IBM LTO Ultrium Tape Drive technology that offers the following capacities and speeds:

Drive Type	Native Capacity	2:1 Compression Capacity	Native Data Rate
Ultrium 3	400 GB	800 GB	80
Ultrium 2	200 GB	400 GB	35
Ultrium 1	100 GB	200 GB	15

Cross Platform Compatibility:

- Ultrium 3 tape Drives normally read and write on Ultrium 3 media. They can also read and write on Ultrium 2 media using Ultrium 2 format. It can read but not write on Ultrium 1 format.
- Ultrium 2 Tape Drives normally read and write on Ultrium 2 media. They can also read and write on Ultrium 1 media using Ultrium 1 format.
- Ultrium 1 Tape Drives normally read and write on Ultrium 1 media, and cannot read or write on Ultrium 2 or Ultrium 3 media.

Ultrium 2 Tape Drives can come with Low Voltage Differential (LVD) Ultra160 SCSI interfaces, High Voltage Differential (HVD) Ultra SCSI interfaces, or the new 2-Gb Fibre Channel interface with fabric attachment.

Ultrium 3 Tape Drives can come with Low Voltage Differential (LVD) Ultra160 SCSI interfaces or the new 2-Gb Fibre Channel interface with fabric attachment.

Additional new features include native switched fabric Fibre Channel drive attachment, Multi-Path architecture, the ability to partition the library into three logical libraries, and an optional control path failover feature for AIX®, Linux, and Solaris.

The library is designed for easy expansion. It can accommodate from one to six tape drives and has cartridge storage configurations that hold 18, 36, 54, or 72 cartridges. With Ultrium 3 tape drives installed, this provides total capacities of 7.2 terabyte (TB), 14.4 TB, 21.6 TB, and 28.8 TB of native data. With 2:1 compression the largest model of tape library can store 57.6 TB of data. Any starting configuration can be upgraded to the maximum configuration of six drives and 72 cartridges. Upgrade features are modular units that are easy to install.

The library offers two input/output (I/O) station options: single-slot or 12-slot. The 12-slot I/O station is required to achieve the 72 cartridge maximum library configuration. With the 12-slot I/O station feature, the library can be configured as 72 storage slots, or 60 storage slots and 12 I/O slots.

All libraries come equipped with one modular dc power supply. A second redundant power supply feature is available.

A Remote Management Unit (RMU) comes standard in every library. The RMU provides remote access to the library over a network. Library status can be sent to the network as Simple Network Management Protocol (SNMP) traps. An application called the TotalStorage Specialist enables network access to the library for more detailed status and control. The TotalStorage Specialist provides access to all library operator panel functions.

The Storage Area Network (SAN) Data Gateway Module is another available library feature. The gateway provides the small computer system interface (SCSI) library with an avenue into a SAN infrastructure. With 2-Gigabit (Gbit) port speeds the library is compatible with 2-Gbit Fibre Channel components. It is also backward compatible with 1-Gbit Fibre Channel hardware.

Figure 1-1 shows an example of an Ultrium Scalable Tape Library with optional features.

- | | | | |
|----------|---|-----------|--------------------------------------|
| 1 | I/O Station (12 slot shown) | 8 | RMU |
| 2 | Front Door | 9 | Casters |
| 3 | Door Lock | 10 | Tape Drive Sled |
| 4 | Door Handle | 11 | Filler Plate |
| 5 | Operator Panel | 12 | AC Input Power Module |
| 6 | Host Interface Board (SCSI) or Serial Diagnostic Port Board | 13 | DC Power Supply |
| 7 | SAN Data Gateway Module (optional) | 14 | Redundant dc Power Supply (optional) |

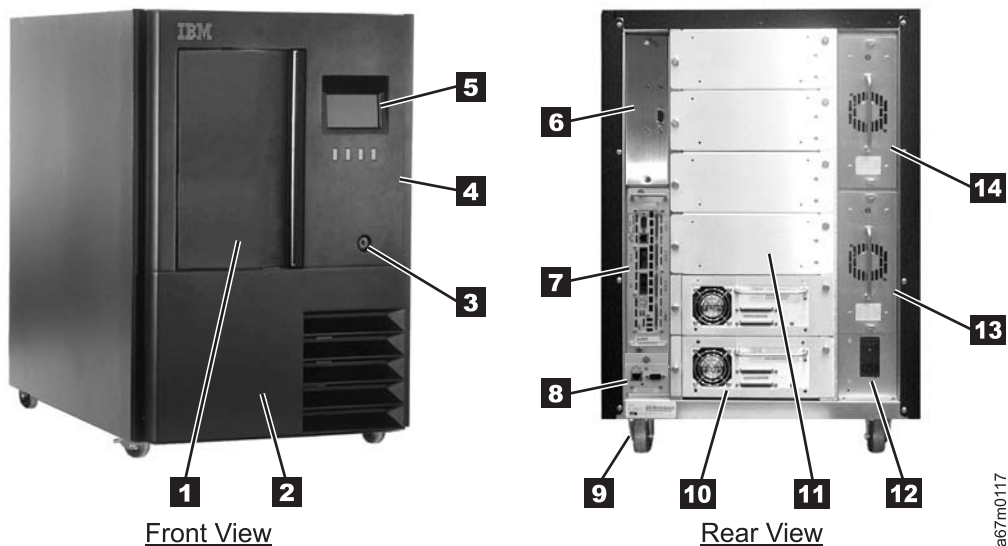


Figure 1-1. Ultrium Scalable Tape Library(Stand-alone configuration)

Server Attachment

The Ultrium Scalable Tape Library can be attached to servers by using:

- “SCSI Interface”
- “Fibre Channel Interface” on page 1-7
- “San Data Gateway Module with Web Interface” on page 1-9

SCSI Interface

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

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

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

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

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

Note: For maximum performance, it is recommended to have two drives per SCSI bus.

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

Physical Characteristics of the SCSI Interface

The Ultrium Scalable Tape Library operates as a set of SCSI-2 or SCSI-3 devices. The Ultrium Tape Drives attach to servers as follows:

- Ultrium 3 Tape Drives use an LVD Ultra160 SCSI interface
- Ultrium 2 Tape Drives use LVD Ultra160 SCSI and HVD Ultra SCSI interfaces
- Ultrium 1 Tape Drives use LVD Ultra2 SCSI and HVD Ultra SCSI interfaces

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

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

- The SCSI bus is terminated properly at each end
- Cable restrictions 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 1-1 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 1-6.

Table 1-1. 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 1-6), 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 1-2 lists the types of SCSI buses and gives the recommended maximum quantity of drives that you can attach.

Table 1-2. 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	N/A	N/A	2 (1 drive with 2:1 compression)
LVD Ultrium 2	N/A	1	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)
LVD Ultrium 1	N/A	2 (1 drive at 2:1 compression)	4 (2 drives at 2:1 compression)	4 (2 drives at 2:1 compression)
HVD Ultrium 1 or 2 (for AS/400 or iSeries; see Note 1)	N/A (see Note 2)	1	N/A	N/A

Notes:

1. If you are using an IBM AS/400 or IBM iSeries, you can attach only one HVD Ultrium 1 Tape Drive to the SCSI bus.
2. N/A = not applicable.

Using Multiple SCSI Buses

The Ultrium Scalable Tape Library has two SCSI connectors for each tape drive in the library. Each drive can be daisy-chained using a SCSI bus jumper that is included with each tape drive.

Removal of any jumpers will create up to 6 SCSI buses per library for attachment to multiple servers or to multiple SCSI adapter cards on one server. Multiple SCSI buses may be required for maximum performance, depending on the application and data compression ratio. Note, however, that library (Medium Changer) control is required on at least one SCSI bus.

The Medium Changer device is required to be addressed via LUN 1 of the lowest-numbered drive position of each logical library. The Medium Changer device may additionally be addressed via LUN 1 of other drives in any logical library.

Any bus containing a Medium Changer device via LUN 1 of a drive is referred to as a control and data path. Any other bus is referred to as a data path. For information about control paths, see "Library Sharing" on page 1-20.

Terminating the Bus

The SCSI bus and all of the wires in the SCSI cable must be properly terminated according to the SCSI standard.

You can mount an external terminator into one of the SCSI connectors. A terminator must be installed on the last device on each end of a string of multiple devices. A terminator is included with each Ultrium Tape Drive.

SCSI Connectors and Adapters

The Ultrium Scalable Tape Library is supported by a wide variety of servers (hosts), operating systems, and adapters. These attachments can change throughout the product's life cycle. To determine the latest supported attachments, visit the web at <http://www.ibm.com/storage/1to>. Or, contact your IBM Sales Representative.

Notes on Connecting to the AS/400 and iSeries Servers: The following conditions apply to the SCSI bus attachment of the Ultrium Scalable Tape Library to the IBM AS/400 and the IBM iSeries servers. (Feature codes in the following list are abbreviated as FC.)

- An interposer (FC 2895 for the Ultrium Scalable Tape Library) is required to connect the library's tape drives to the Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only). No interposers are required to connect the library's tape drives to the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), or Magnetic Media Controller (FC 6534).
- The PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), and Magnetic Media Controller (FC 6534) provide one port.
- The Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only) provides two ports, but one port must remain unused when connecting the Ultrium Scalable Tape Library. Each port can support one or two of the library's tape drives, but only one is recommended for optimum performance.
- When the Ultrium Scalable Tape Library's tape drives are attached, no other devices can be supported on the ports for the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), or Magnetic Media Controller (FC 6534).
- An AS/400 or iSeries server cannot be interconnected with any other server (including another AS/400 or iSeries server) on the same SCSI bus.
- For the Ultrium Scalable Tape Library to be shared by an AS/400 or iSeries server and another type of server at the same time, the library must be configured with multiple logical libraries (see "Library Sharing" on page 1-20).
- For the Ultrium Scalable Tape Library to be shared by two or more AS/400 or iSeries servers at the same time, the library must be configured with multiple control paths (see "Using Multiple Control Paths" on page 1-23).
- If you plan to use the Ultrium Scalable Tape Library as an alternate IPL device, you must set one of the SCSI addresses on its tape drives to 0 when you attach it with the PCI Magnetic Media Controller (FC 2729), PCI Ultra Magnetic Media Controller (FC 2749), Magnetic Media Subsystem Controller (FC 6501; applies to Ultrium 1 Tape Drive only), Magnetic Media Controller (FC 6534), or 5702 adapter.
- Maximum performance by the Ultrium Tape Drive cannot be achieved with HVD SCSI. No increase in performance is expected by replacing HVD Ultrium Tape Drives with HVD Ultrium Tape Drives. Maximum performance can only be achieved with LVD SCSI or Fibre Channel attachment.
- LVD SCSI is supported with OS/2 V5R2 and the 5702 adapter. The 5702 uses Ultra160 SCSI technology and VHDCI cable connectors. Multiple Ultrium Tape Drives can be attached to one 5702 adapter, but performance must be taken into consideration. Each iSeries adapter must have at least one control path configured with the attached drives. The LVD Ultrium 1 Tape Drives are not supported.
- Multiple HVD SCSI Ultrium Tape Drives can be attached to the Magnetic Media Controller (FC 6534), PCI Magnetic Media Controller (FC 2729), or PCI Ultra Magnetic Media Controller (FC 2749) adapters, but performance must be taken into consideration. The HVD Ultrium 1 Tape Drive is limited to one drive per iSeries adapter. Each iSeries adapter must have at least one control path configured with the attached drives.

Fibre Channel Interface

Cables and Speeds

- I Ultrium 3 and Ultrium 2 Fibre Channel tape drives use LC duplex fiber optics cables.

The maximum distances that the Ultrium Scalable Tape Library supports on a Fibre Channel link is determined by the link speed, the type of fiber (50 micron or 62.5 micron), and the device to which the library is attached.

If the library attaches to an HBA, refer to the distances that are supported by the HBA. If the library attaches to a switch, the supported distances are:

- For a 50-micron cable:
 - 1-Gb link speed = up to 500 m (1640 ft)
 - 2-Gb link speed = up to 300 m (984 ft)
- For a 62.5-micron cable:
 - 1-Gb link speed = up to 175 m (574 ft)
 - 2-Gb link speed = up to 150 m (492 ft)

The Ultrium Scalable Tape Library uses 50-micron cables internally. Therefore, you must use a 50-micron cable to attach to the library's port. To attach to a 62.5-micron SAN, you must attach the 50-micron cable to an active port, such as a port on a switch.

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 WWNN to be bound to a specific SCSI target ID. After a configuration has been set, it survives reboots and any hardware configuration changes because the information is preserved. If a drive needs to be replaced, the new drive assumes the WWNN of the old drive because the WWNN for the drive is location-dependent within the library. Because the WWNN does not change, persistent binding does not need to be changed which would cause an outage.

Connectors and Adapters

The Ultrium Scalable Tape Library is supported by a wide variety of servers (hosts), operating systems, and adapters. These attachments can change throughout the product's life cycle. To determine the latest supported attachments, visit the web at <http://www.ibm.com/storage/1to>. Or, contact your IBM Sales Representative.

Connecting to the iSeries Server

The iSeries does not require or allow you to set the Fibre Channel adapter settings. The adapter automatically detects the connection type and device addressing. OS/400 support is as follows:

- For V5R1, the adapter supports:
 - A single target with multiple LUNs
 - 1-Gb/s connection

- For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
- For a point-to-point topology, connection through an N_port (directly to device only)
- Does not support fabric
- For V5R2, the adapter supports:
 - Up to 16 devices, including multiple targets and multiple LUNs (each LUN on each target counts as a device)
 - 2-Gb/s connection (but will negotiate down to 1 Gb/s if necessary)
 - For a Fibre Channel-Arbitrated Loop topology, connection through an L_ port to a device, hub or switch
 - For a point-to-point topology, connection through an N_port to an F_port

The iSeries Fibre Channel adapter does not support D-mode Alternate IPL. The Alternate Installation function is used to restore a system from a Fibre Channel-attached device. With Alternate Installation support, the system is loaded from a CD and directed to the Fibre Channel-attached device for a restore from the tape that contains the saved data. The code on the CD is only used to get the restore from tape started. All code and program temporary fixes (PTFs) are restored from the tape that contains the saved data.

Sharing on a Storage Area Network

With Storage Area Network (SAN) components, the possibilities for connecting multiple systems and multiple drives have increased. Not all software and systems are designed to share drives. Before you install a drive that would allow two systems to share it, check that the systems and their software support sharing. If your software does not support sharing, note that Fibre Channel switches have a zoning capability to form a SAN partition. For systems that do not cooperate, use zoning to prevent the systems from sharing the same drive. You can remove zoned partitions as you upgrade software and system levels.

San Data Gateway Module with Web Interface

Attention

NOT SUPPORTED WITH ULTRIUM 3 TAPE DRIVES.

The Ultrium Scalable Tape Library can be connected to a Fibre Channel server by using the optional SAN Data Gateway Module. The gateway is the interface between the tape library and the SAN (Storage Area Network) or Fibre Channel server. It provides Fibre Channel connectivity to the SCSI tape drives and SCSI medium changer in the library.

For installation instructions, refer to the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*,(GA32-0436).

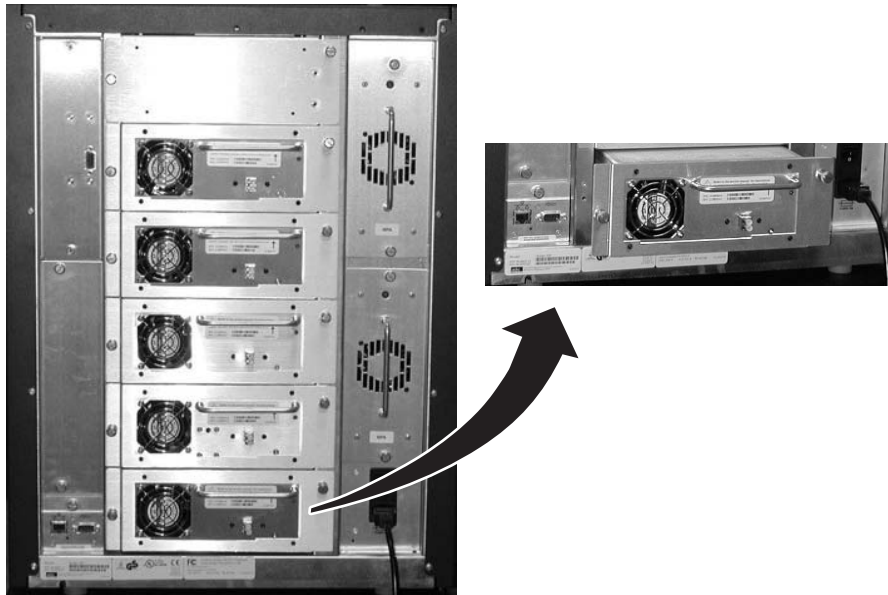
Tape Drives and Drive Sleds

The Ultrium Scalable Tape Library supports the IBM Ultrium 3 Tape Drive, Ultrium 2 Tape Drive, and Ultrium 1 Tape Drive. Although the library can contain both LVD and HVD drives, both types of drives cannot reside on the same SCSI bus.

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

Ultrium 3 Tape Drives

The IBM Ultrium 3 Tape Drive supports Fibre Channel or LVD Ultra160 interfaces. It features two HD68 connectors or one LC Fibre Channel connector. Figure 1-2 shows a Fibre Channel Ultrium 3 Tape Drive.

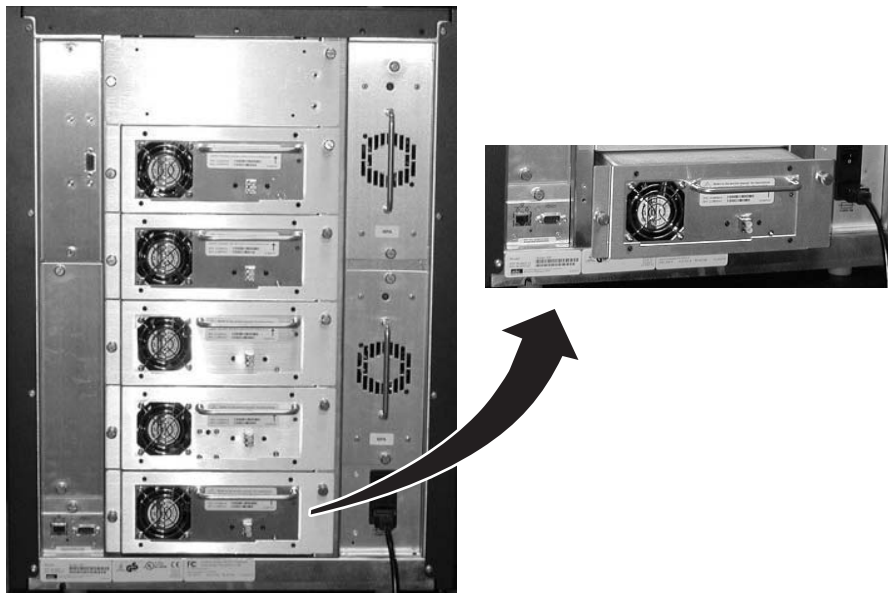


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Figure 1-2. Fibre Channel Ultrium 3 Tape Drive in the Ultrium Scalable Tape Library

Ultrium 2 Tape Drives

The IBM Ultrium 2 Tape Drive supports Fibre Channel, LVD Ultra160, or HVD Ultra SCSI interfaces. It features two HD68 connectors or one LC Fibre Channel connector. Figure 1-3 shows a Fibre Channel Ultrium 2 Tape Drive.



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Figure 1-3. Fibre Channel Ultrium 2 Tape Drive in the Ultrium Scalable Tape Library

Ultrium 1 Tape Drives

IBM Ultrium 1 Tape Drive supports LVD Ultra2 SCSI or HVD Ultra SCSI interfaces. It features two HD68 connectors. Figure 1-4 shows a SCSI Ultrium 1 Tape Drive.



Figure 1-4. SCSI Ultrium 1 Tape Drive in the Ultrium Scalable Tape Library. The tape drive is contained in a removable drive sled. The view is from the rear of the library.

Speed Matching

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

Channel Calibration

- | The channel calibration feature of the Ultrium 3 Tape Drive and the Ultrium 2 Tape Drive customizes each read/write data channel for optimum performance. The customization enables compensation for variations in the recording channel transfer function, media characteristics, and read/write head characteristics.

Power Management

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

Tape Cartridges

- | The library uses Ultrium Tape Cartridges that provide up to 400 GB native capacity and up to 800 GB with 2:1 hardware data compression. Supported cartridges include:
 - IBM TotalStorage LTO Ultrium 400 GB Data Cartridge (Ultrium 3)
 - IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
 - IBM LTO Ultrium 100 GB Data Cartridge (Ultrium 1)
 - IBM TotalStorage LTO Ultrium Cleaning Cartridge
 - LTO Ultrium Cleaning Cartridge

Each tape cartridge in the library **must** have an external bar code label that is operator and machine readable to identify the volume serial number (volser). The external label contains up to eight characters

for the volser. The first six positions can be uppercase A–Z, or numerics 0–9, and the last two positions are reserved. If a cartridge in a storage or I/O station slot (other than I/O station slot 1) does not contain a label, the bar code reader on the robotics will treat that slot as empty.

For information about the types of labels that are supported by the library, refer to the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.

The external bar code labels on the cartridges identify the cartridges to the tape library. The internal volser must be identical to external bar code label on the physical volume.

Certain restrictions apply to mixing media in drives and mixing drive types. The sections that follow describe those restrictions.

Mixing Media in Drives

Not all cartridges that are supported by the Ultrium Scalable Tape Library are compatible with its drives. Table 1-3 on page 1-13 gives a matrix of compatible cartridges and drives.

Note: When labeled according to proper IBM bar code label specifications, the last character of the cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000416L3 is an Ultrium 3 cartridge; a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge.

Table 1-3. Compatible cartridges and drives

Cartridges	Drives (see Notes 1 and 2)		
	Ultrium 3 Tape Drive	Ultrium 2 Tape Drive	Ultrium 1 Tape Drive
Ultrium 3 Data Cartridge (xxxxxxL3)	Y	N	N
Ultrium 2 Data Cartridge (xxxxxxL2)	Y	Y	N (see Note 3)
Ultrium 1 Data Cartridge (xxxxxxL1)	Read Only	Y	Y
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal, CLNUxxL1)	Y	Y	Y (see Note 4)
LTO Ultrium Cleaning Cartridge (IBM only, CLNIxxL1)	Y	Y	Y

Notes:

1. Y = supported.
2. N = unsupported.
3. The library rejects any command to move an Ultrium 2 or Ultrium 3 data cartridge with an L2 or L3 bar code identifier to an Ultrium 1 drive, and returns a sense key of 5 and an additional sense code/additional sense code qualifier of 30/00.
4. Requires drive firmware level 25D4 or higher.

Mixing Drive Types

The Ultrium Scalable Tape Library supports mixed Ultrium drive types in the same logical library. Some independent software vendors (ISVs) support mixed drive types within logical libraries; others do not. Some ISVs that support mixed drive types do so with restrictions. For details, have the customer contact the applicable ISV.

For situations where the ISV support does not exist or does not meet customer requirements, the Ultrium Scalable Tape Library provides another option to protect the customer's investment by partitioning the tape drives into separate logical libraries. The quantity and location of slots per partition are predetermined and set by using menus in the library (see the section about partitioning logical libraries in the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*. For additional details, see "Multi-Path Architecture" on page 1-20.

Figure 1-5 on page 1-14 shows examples of methods for mixing Ultrium drive types.

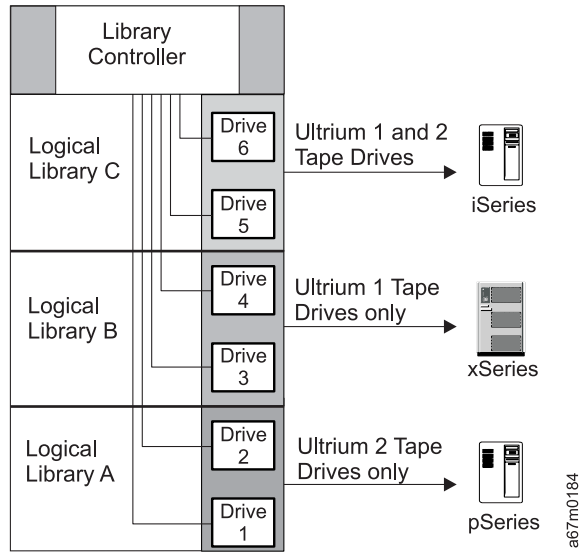


Figure 1-5. Examples of methods for mixing Ultrium drive types

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 drive 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 1-4 on page 1-15 gives the environment for operating, storing, and shipping IBM LTO Ultrium Tape Cartridges.

Table 1-4. Environment for operating, storing, and shipping the IBM LTO Ultrium Tape Cartridge

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

Functional Units

The Ultrium Scalable Tape Library consists of the following functional units:

- Tape drives in drive sleds
- Cartridge storage
- Tape cartridge
- I/O station
- Library control hardware
- Robotics system
- RMU with TotalStorage Specialist
- SAN Data Gateway Module with TotalStorage Specialist (optional)

Except for the tape drives and tape cartridges, which are discussed on pages 1-9 and 1-11, the sections that follow describe each functional unit.

Cartridge Storage

The Ultrium Scalable Tape Library can have up to five columns. One column contains tape drives, and one to four columns contain cartridges. The columns are numbered 1 to 5 beginning with the I/O station column and continuing clockwise. Column 1 can be a single slot I/O station or a multiple slot I/O station. Column 2 is a cartridge storage column and is standard in all libraries. Column 3 is the drive column. Columns 4 and 5 are optional cartridge storage columns which may also be installed depending on the configuration.

Storage Slot Numbering

The I/O station and cartridge storage columns can have storage slot number designations. Each cartridge column has three magazines containing six storage slots. The magazines within each column are designated A to C from top to bottom. The slots within each magazine are numbered 1 to 6 from top to bottom. The drives within the drive column are designated 1 to 6 from bottom to top (see Figure 1-6 on page 1-16).

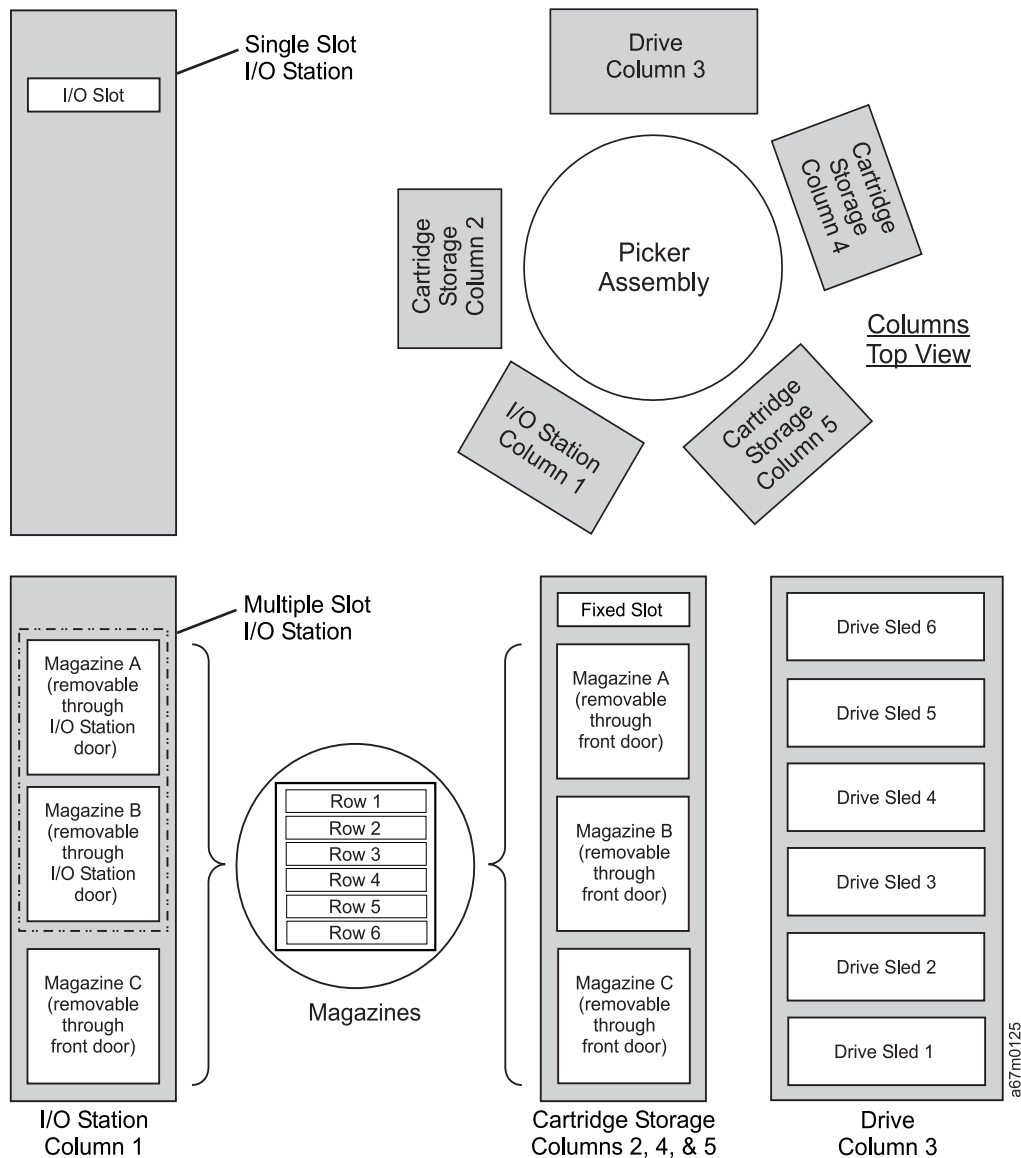


Figure 1-6. Storage Column Configurations and Coordinate system

A cartridge's physical address is represented as the column, magazine, slot location. Thus, for example, a cartridge with a physical address of [4 C 2] is located in the fourth column, bottom magazine, second magazine slot from the top.

Note: The location for the picker is identified as [0 @ 0].

To manipulate the media within the library, the host must reference each movement with source and target designations. This is done via element addressing, which specifies precisely which slots within the library are to be used. For information about element addressing, see "Element Addressing" on page C-1.

The total number of slots available per storage column is 19. However the host system only has access to 18. The fixed slot located at the top of storage columns 2, 4, and 5 is reserved for the cleaning cartridge when the autoclean function is enabled. The bar code reader cannot read the label on the cartridge if it is stored in the nonaddressable slot.

I/O Station

This facility allows the insertion and ejection of cartridges without interrupting the normal operation of the library. There are two models of the I/O station:

- The single slot I/O station has a capacity of one cartridge. The cartridge can be inserted or ejected by opening the I/O station door.
- The 12-slot I/O station has a capacity of 12 LTO cartridges contained in two magazines. Magazines and cartridges can be inserted or removed by opening the I/O station door. There is also one fixed magazine that contains six LTO storage slots inside the front door, just below the I/O station door. The 12-slot I/O station can also be configured as 12 additional storage slots. The configuration determines the number of cartridges available for data storage. Table 1-5 presents all possible I/O, storage combinations.

Table 1-5. Ultrium Scalable Tape Library Configurations

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

Library Control Hardware

The library control hardware controls all operations in the Ultrium Scalable Tape Library, including the interaction between the library and operators. The library firmware creates and maintains the tape library configuration, the physical location of the robotic system and the inventory of cartridges. The database will be kept in the flash memory of the library control hardware.

Robotic System

The robotic system identifies and moves cartridges between the storage slots, tape drives and the I/O Station. The robotic system has:

- A picker assembly for mounting a cartridge gripper and the bar code reader.
- A cartridge gripper for picking and placing cartridges in storage slots, tape drives or the I/O Station.
- A bar code reader for reading the external labels on the cartridges. The bar code reader is used during the inventory process to locate and categorize all cartridges installed in the library. The bar code reader is also used during the teaching process. The bar code reader reads the fiducial labels to identify the types of storage magazines and tape drives installed in the library. Fiducial labels are bar code labels located on tape drives and storage magazines. Each label has a different value to identify various types of storage magazines or tape drives that may be installed in the library.
- A vertical (Y) axis drive for moving the picker assembly vertically in the library.
- A rotary (X) axis drive for moving the picker assembly between storage columns and drive columns.
- A reach (Z) axis drive for moving the gripper part of the picker assembly in a forward and backward motion.

RMU with TotalStorage Specialist

The 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 host on the network can access the library if it has a Web browser installed. The RMU supports Microsoft® Internet Explorer version 4.0 and above, as well as

Netscape Navigator versions 4.01, 4.5, and 4.7X. The RMU can access all available functions without a dedicated server or separate software. With the RMU and the TotalStorage Specialist you can perform many remote functions:

- Checking system status, library and drive conditions, and firmware levels
- Operating all library operator panel functions
- Updating firmware in the RMU, the library controller, and the tape drives
- Retrieving the library command and error logs, drive dumps, and the RMU error log
- Configuring changes such as network, users, and date and time changes
- Accessing online tape library documentation

The RMU supports SNMP version 2.0 and can act as an SNMP server, responding to SNMP requests and generating SNMP traps. An internal library serial interface enables the RMU to acquire TapeAlert 3.0 compatibility information from the drives and to send this information to an SNMP server. In the event of a power loss, the RMU will detect the loss and generate an SNMP trap for notification.

SAN Data Gateway Module with TotalStorage Specialist

Attention

NOT SUPPORTED WITH ULTRIUM 3 TAPE DRIVES.

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

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

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

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

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

Optional Features

Table 1-6 lists the optional features for the Ultrium Scalable Tape Library.

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

Table 1-6. *Optional features and codes for the Ultrium Scalable Tape Library*

	Optional Feature	Feature Code
I	Ultrium 3 Tape Drive with 2-Gb Fibre Channel interface	8035
I	Ultrium 3 Tape Drive with Low Voltage Differential (LVD) Ultra160 SCSI interface	8033
	Ultrium 2 Tape Drive with 2-Gb Fibre Channel interface	8105
	Ultrium 2 Tape Drive with High Voltage Differential (HVD) Ultra SCSI interface	8104
	Ultrium 2 Tape Drive with Low Voltage Differential (LVD) Ultra160 SCSI interface	8103
	Ultrium 1 Tape Drive with LVD Ultra2 SCSI interface	8003
	Ultrium 1 Tape Drive with HVD Ultra SCSI interface	8004
	SAN Data Gateway Module, LVD	8005
	Rackmount kit	8006
	18-slot tape storage column	8007
	Redundant DC power supply	8008
	12-slot I/O station	8012
	6-cartridge magazine with cover	8013
	Control path failover	1680
I	Data path failover	1681
	Multi-Path feature	9450 (if ordered with new library)
		1450 (if ordered to upgrade existing library)

Feature License

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

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

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

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

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

Multi-Path Architecture

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

- Small Computer Systems Interface (SCSI)
- Fibre Channel

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

The Multi-Path Architecture also lets you configure additional control paths for any one logical library. A control path is a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library. Additional control paths reduce the possibility that failure in one control path will cause the entire library to be unavailable. Use of the control path failover feature further reduces that possibility (see "Using Multiple Control Paths for Control Path Failover" on page 1-24).

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

Library Sharing

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

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

- Configure the library so that it is partitioned into separate logical libraries that independently communicate with separate applications through separate control paths. This configuration (see example **1** in Figure 1-7 on page 1-22) requires no special capabilities from the server or application. (For more information, see “Using Multiple Logical Libraries” on page 1-23.)
- 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 1-7 on page 1-22). 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 1-7 on page 1-22). This configuration is used in high-availability environments such as IBM’s High Availability Clustered Microprocessing (HACMP) and Microsoft’s Systems Management Server (SMS) and Clustered Server Environments. Multi-initiator configurations are only supported by certain adapters and ISVs. Check with your ISV.
 - Configuring a single logical library to communicate with multiple servers through multiple control paths. This configuration (see example **4** in Figure 1-7 on page 1-22) requires that you add control paths (see “Using Multiple Control Paths” on page 1-23). 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 1-22. Many configurations are possible, and you can design them according to your business needs.

Example Configurations

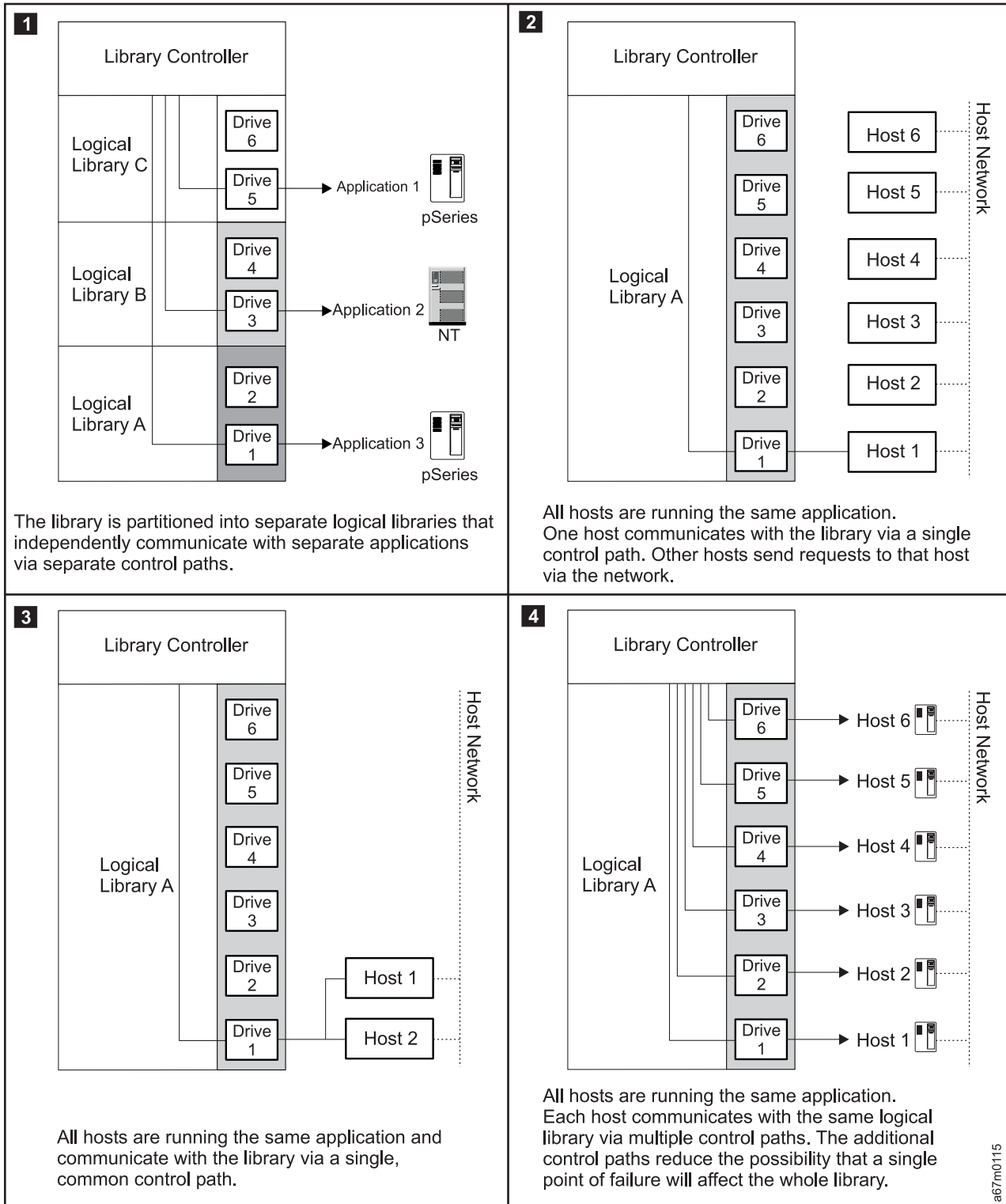


Figure 1-7. Examples of configurations for a Ultrium Scalable Tape Library. Lines from one or more drives to the library controller represent control paths.

Using Multiple Logical Libraries

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

You can partition the Ultrium Scalable Tape Library into a maximum of three logical libraries. Each logical library consists of:

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

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

A logical library cannot share another logical library's tape drives and storage slots. However, it does share the I/O slots and the cartridge accessor on a first-come, first-served basis.

The sections that follow describe these uses for multiple logical libraries. To create or change multiple logical libraries within your library, refer to the section about partitioning logical libraries in the *IBM TotalStorage 3583 Tape Library Planning and Operator Guide*.

When automatic cleaning is enabled, any appropriate cleaning cartridge may be used to clean a drive in any configured logical library, even if the cartridge resides in a column for a different logical library. For additional details, see the sections about cleaning drives and enabling the autoclean function in the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.

Using Multiple Logical Libraries for Library Sharing

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

Using Multiple Logical Libraries for Mixed Drive Types

For applications that cannot support Ultrium 1, Ultrium 2, and Ultrium 3 Tape Drives and media in the same logical library, you can partition multiple logical libraries to keep the drives and media separate. By partitioning the physical library into one or more logical libraries, you ensure investment protection for any one Ultrium 1 Tape Drive.

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

Using Multiple Control Paths

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

each control path for a logical library can accept commands while the library is in use by another control path. By default, a logical library can communicate with the server only through the first LUN-1-enabled drive that is installed in the partition.

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

To add or remove additional control paths, refer to the appropriate section in the *IBM TotalStorage 3583 Tape Library Planning and Operator Guide*. For a particular logical library, you can enable as many control paths as there are drives in that logical library.

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

Using Multiple Control Paths for iSeries and AS/400 Attachment

The use of control paths for the iSeries and AS/400 servers is unique. In general, every iSeries adapter must “see” the control path that is associated with the drives to which it is connected. Table 1-7 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 1-7. 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		Quantity of Ultrium 1 Tape Drives	
	OS/400 5.1	OS/400 5.2	OS/400 5.1	OS/400 5.2	OS/400 5.1	OS/400 5.2
HVD	N/A	N/A	1 to 6	1 to 6	1	1
LVD	1 to 6	1 to 6	1 to 6	1 to 6	N/A	N/A
Fibre Channel	1 to 6	1 to 6	1 to 6	1 to 6	1 to 6	1 to 6
Note: N/A = not applicable						

Using Multiple Control Paths for Control Path Failover

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

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

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

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

Using Multiple Data Paths

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.

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, refer to your device driver documentation.

Specifications

Table 1-8 lists the specifications for the Ultrium Scalable Tape Library.

Table 1-8. Specifications for the Ultrium Scalable Tape Library

Specification	Measurement		
Physical Specifications			
Width	44.1 cm (17.4 in.) rack unit		
	48.1 cm (18.9 in.) stand alone unit		
Depth	73.5 cm (28.9 in.)		
Height	68.5 cm (27.0 in.) (with casters)		
Weight (6 drives and 72 cartridges)	65.8 kg (145 lb) (minimum configuration, no cartridges)		
	101.6 kg (224 lb) (maximum configuration, no cartridges)		
	118.4 kg (261 lb) (maximum configuration, with cartridges)		
Height of library in rack	14 EIA units		
Power Specifications			
Voltage	100 to 240 Vac, 50 to 60 Hz		
Current for 100 Vac	7.0 A		
Current for 240 Vac	3.5 A		
Maximum electrical power	0.840 kVA		
Inrush current	45 A at 120 Vac, 90 A at 208 Vac		
Other Specifications			
Maximum altitude	2500 m (8202 ft) for operating and storage		
Environmental Specifications			
Environmental Factor	Operating (see Note)	Storage	Shipping
Drive temperature	10 to 38°C (50 to 100°F)	-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)
Heat output	542 W (483 Cal/Hr)	Not applicable	Not applicable
Relative humidity	20 to 80%	10 to 90%	10 to 90%
Maximum wet bulb temperature	26°C (79°F)	Noncondensing	Noncondensing

Table 1-8. Specifications for the Ultrium Scalable Tape Library (continued)

Note: The operating environment of the library must not conflict with the media storage requirements (see the section about media storage requirements in the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*. The library may be capable of operating at elevated temperatures for an extended period of time, the temperature could shorten the useful life of media that is stored in the library. If media is stored in the library for more than 10 hours, the storage temperature requirements for media should be met. It should be assumed that media stored in the library will be 2 degrees above ambient temperature when the library is powered on.

Product Environment

The tape library is designed to operate in a general business environment.

The library meets the acoustical requirements for general business area category 2D. Category 2D states that the library should be installed a minimum of 4 m (13 ft.) from a permanent work station.

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

The library is a precision computer peripheral. To ensure maximum longevity of your library, place the library away from dust, dirt, and airborne particulates:

- Keep the library away from high-traffic areas, especially if the floor is carpeted. Carpeting harbors dust and people walking on the carpet can cause the carpet fibers and the dust to become airborne.
- Keep the library out of computer-printer rooms because of toner and paper dust. Additionally, do not store paper supplies next to the library.
- Keep the library away from moving air caused by doorways, open windows, fans, and air conditioners.

Ensure that the machine covers are always kept closed to minimize any contamination from airborne particles.

Maintenance Plan

The tape library consists of two hardware subsystems, the library and the tape drives. The tape drive is packaged in a common drive sled and each drive sled is a FRU. When a drive failure occurs, the drive sled is removed and returned to IBM for repair. The tape library maintenance package supports the library and the library interfaces with the tape drives.

Maintenance Start

Start all maintenance activity for the tape library and the integrated subsystem using the **START** section in this manual. A symptom to action table is provided to quickly determine which procedure to use for the reported problem. You are also shown how to prepare the library for service. Subsystem problem determination information is included to help determine the failing components. For hardware failures, the Field Engineer will be directed to one of the following procedures to continue with maintenance activity:

- The START procedure in this manual
- The Tape Drive Supplemental Maintenance Package if available.

Preventive Maintenance

There is no Preventive Maintenance required on the library at this time. Service Action Code “**FB**” is reserved for future expansion should there be a requirement for Preventative Maintenance.

Functional Diagram

The diagram on page 1-30 show the major functional areas of a library with and without the Multi-Path feature. The items enclosed in boxes are FRUs. Table 1-9 describes each functional area.

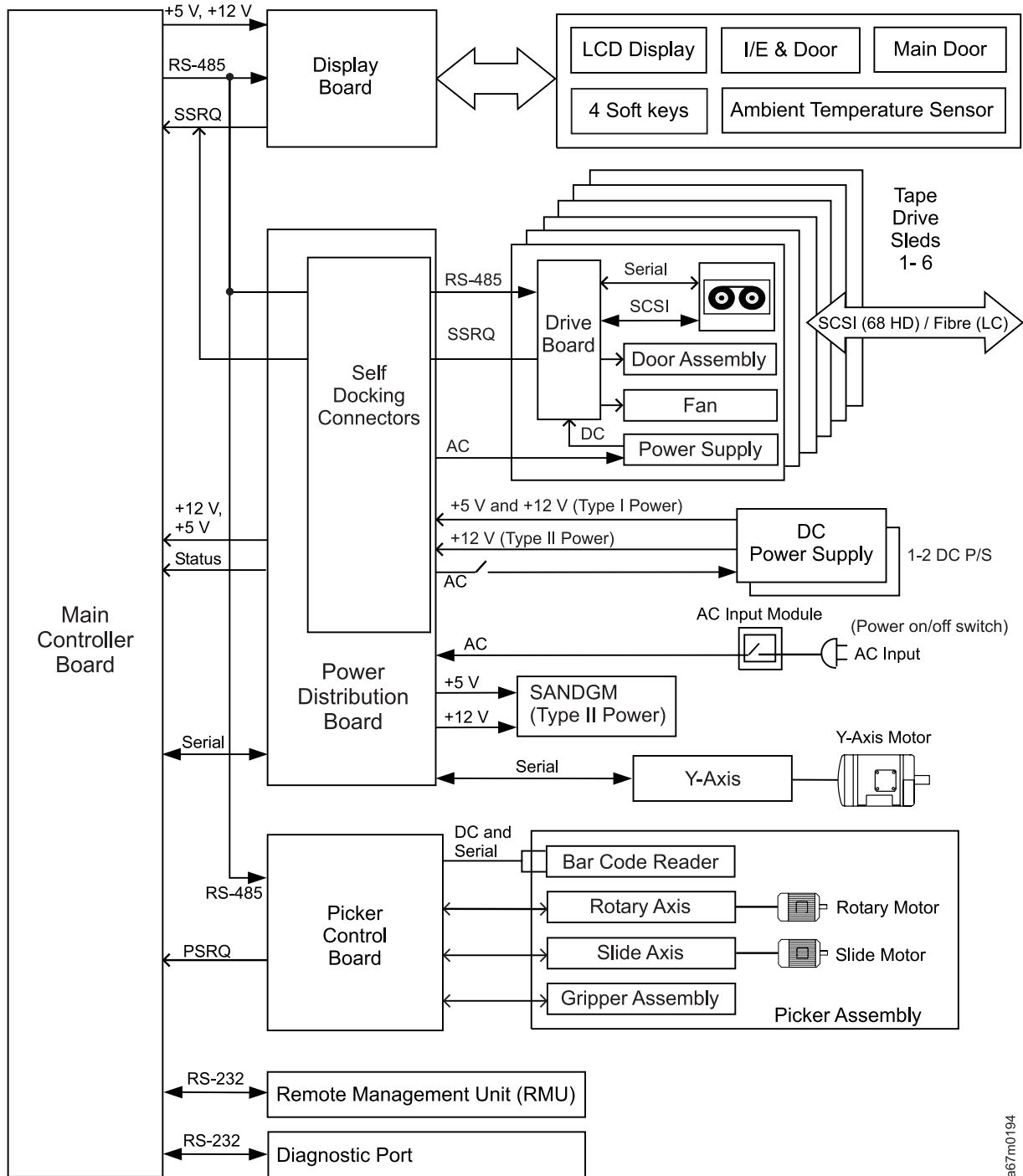
Table 1-9. Tape Library Major Functional Areas

FRU/Sub-Assembly	Description
Host Interface Board (SCSI)	High voltage differential (HVD) and low voltage differential (LVD) SCSI adapter board. This board is connected to the main controller board on one side and the SCSI host system on the other side. Also contains a serial interface into the library. Note: This board will be present in a converted library.
Serial Diagnostic Port Board	An adapter board connected to the main controller board and used as a serial interface to the library.
*Main Controller Board	Library control board, this board contains microprocessor, memory, motion control, digital input and output (DI/DO), serial ports, real time clock and interface to other boards in the library.
*Display Assembly	Operator panel assembly which contains all switches and interfaces to a message display to allow operator/CE to communicate with the library. This assembly also controls the operations of the I/O Station, the door interlock system, and ambient temperature sensor.
Power Distribution Board	Connector board which receives ac input from the ac power module. It distributes ac to dc power supplies and tape drive sleds. It also distributes dc voltages to the library and drives. The power distribution board also contains the servo controller for the Y-axis. There are two versions of the power distribution board: Type I is used with its companion dc power supply in older libraries Type II contains a dc-to-dc converter that generates +5 Vdc from 12 Vdc and is used in current production libraries. It requires a companion dc power supply.
Picker Control Board	This board communicates with the main controller board and controls the rotary axis, gripper assembly and bar code reader.
Picker Assembly	This assembly contains motor, sensors and mechanical components to move the picker in the rotary axis and pick the cartridge.
Picker Carriage Arm Assembly	This assembly contains the picker assembly and the picker control board.
Bar Code Reader	Used in reading the bar code label on each cartridge as well as fiducial labels located throughout the library. It is also used in teaching and inventory of the library subsystem, the bar code reader is not a separate FRU but a part of the picker assembly.
Y-Axis Motor and Belt	Motor assembly to move the picker in vertical directions.
dc Power Supplies	There are two types of dc power supplies: <ul style="list-style-type: none"> • Type I produces both 12 Vdc and +5 Vdc power and must be used with its companion power distribution PCBA. This power supply is used in an older library. • Type II only produces +12 Vdc and must be used with its companion power distribution PCBA. This power supply is used in the current production libraries.
I/O Station	This assembly allows the operator to insert and eject cartridges without interrupting the operation of the library. Contains motor, sensors and storage slots.

Table 1-9. Tape Library Major Functional Areas (continued)

FRU/Sub-Assembly	Description
ac Input Power Module	This assembly is connected to the customer's ac power source and distributes ac to all major subassemblies within each tape library module (dc power supplies, drives). It also contains a switch that controls the input ac and has replaceable fuses for protection.
Tape Drive Sled	Individual tape drive, dc power supply and drive control board packaged in one assembly.
Storage Area Network (SAN) Data Gateway Module (SANDGM)	The SANDGM allows the library and its drives to connect to a Fibre Channel server.
*Remote Management Unit (RMU)	Unit that is connected to the Main Controller Board and used for remote management of the library.
Note: * = Locations where vital product data (VPD) is stored in the library.	

Functional Diagram for a Library With the Multi-Path Feature



a67m0194

Figure 1-8. Functional diagram for a library with the Multi-Path feature

Supported Servers, Operating Systems, and Software

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

- Visit the web at <http://www.storage.ibm.com/tape/1to/3583/3583opn.pdf>, then:
- Contact your IBM Sales Representative.

Notes:

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

Supported Device Drivers

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

- Using a browser, type one of the following:
 - <http://www.ibm.com/storage/1to>
 - <ftp://ftp.software.ibm.com/storage/devdrv>
- Using File Transfer Protocol (FTP), 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 Portable Document Format (.pdf) and Postscript (.ps) versions of its device driver documentation in the /storage/devdrv/Doc directory:

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

A list of device drivers for each supported server appears at /storage/devdrv/ in the following directories:

Note: The device driver for the AS/400 server and iSeries server is included in the OS/400 operating system.

- AIX
- HPUX
- Linux
- Solaris
- Windows

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

Chapter 2. Safety Instructions

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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. The notices are accompanied by symbols that represent the severity of the safety condition.

Read and carefully observe the hazard alert information in this guide and in the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.

Danger Notice

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







DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

Caution Notice





A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by one of several symbols shown in Table 2-1:

Table 2-1. Caution Notice Symbols

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
	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.

Sample caution notices (See Table 2-2):

Table 2-2. Examples of Symbol Use

	<p>The controller card contains a lithium battery.</p> <p>CAUTION: The battery is a lithium ion battery. To avoid possible explosion, do not burn. Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery available when you call. (C007)</p>
	<p>CAUTION: To avoid personal injury, before lifting this unit, remove all appropriate subassemblies per instructions to reduce the system weight. (C012)</p>
 <p>> 18 kg (40 lb)</p>	<p>CAUTION: The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons and/or a lifting device to safely lift this part or unit. (C011)</p>
	<p>CAUTION: This assembly contains mechanical moving parts. Use care when servicing this assembly. (C025)</p>

Attention Notice

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



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

Attention: Do not operate the Tape Library in a poor air-quality environment. If your environment contains an excessive amount of particulates, contact your service representative for more information.

Area of Application

The information in this document applies to the entire Tape Library. Additional safety instructions for components used in the equipment are not invalidated by these instructions.

Note: Other manufacturers' documentation forms an integral part of the Tape Library documentation.

This *manual* is intended for training personnel for service work and maintenance work. Therefore, the hazard alert messages apply only to maintenance of the equipment. Knowledge of safety rules for work on electronic and mechanical systems is required. Only trained specialists (maintenance trained) are allowed to maintain and repair the Tape Library.

Laser Safety and Compliance

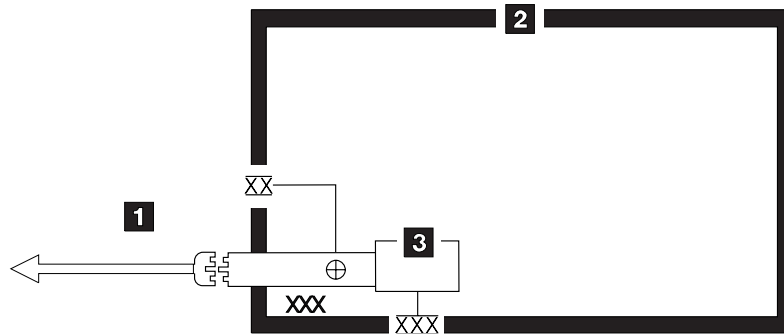
Before using the Tape Library, review the following laser safety information.

Class I Laser Product

The 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.

3583 Library ac Grounding Inspection

1. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
2. Disconnect all cables.
3. See Figure 2-1. Disconnect the power cord **1** from its source.
4. Check that no voltage exists between the housing on the power source and building ground.
5. Check that resistance is less than 0.1 ohm from the building ground to the power supply enclosure **3**.
6. Inspect the power cable **1** for visible cracks, wear, or damage.
7. Check that the resistance between the power cable ground and the library frame **2** is less than 0.1 ohm.
8. Inspect the power supply enclosure covers **3** to ensure all screws are installed and tight.



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

A1400040

Figure 2-1. AC Grounding Diagram (50 Hz and 60 Hz)

Guards

The Tape Library system is equipped with the following guards:

- Access Control
- Main Switch

Access to the Library

The Tape Library is completely enclosed in a housing. The only access is provided by the monitored guard door. The interlock is active when the Main Switch is switched ON.

The housing around the Tape Library serves as a separating guard. It separates the danger area of the Tape Library system from the normal working area.

The danger area of the Tape Library system is the area in which persons could be injured because of hazardous movements of the handling unit.

Hazardous movements can be:

- Expected movements
- Unexpected movements

The guard door can be opened from the outside only with a key. An authorized person is responsible for this key.

CAUTION:

In the Tape Library, movements of components can cause serious injury. Access to this area is, therefore, restricted to authorized persons. Persons who are not trained in the use of the system should enter the Library only under supervision.

Main Switch

Before working inside the Tape Library or working with electrical components, ensure that the Main Switch **1** in Figure 2-2 is OFF.



Figure 2-2. ac Power Module and dc Power Supplies locations

Before Working on Equipment

Before beginning work, become familiar with the location of the:

- Main Switch
- Power source connection

Note: Bridging of door guards is not advisable.

Attention: Never put door guards out of operation other than as instructed by supervision.

All drive units and all hazardous voltages are switched OFF.

Proceed with extreme caution if the system cannot be switched off at the main switch because of required work (for example, functional checks).

Normal Operating Modes

In normal operation, the host controls the Tape Library.

Emergency Operating Mode

Emergency operations are meant for:

- Manual inserts and retrievals of media
- Manual operation of the drives

Before Restarting Equipment

Movement of components inside the library can cause serious injury. Before starting the Tape Library, ensure that the library door is closed.

Working on Parts With Line Voltage Present

Caution Statements:

1. **Contact with live electrical parts can cause severe or fatal burns and internal injury as the consequence of electrical shock. After contact with live parts, persons often cannot break loose from the part by themselves.**
2. **Components being worked on must only have voltage present when this is specifically required.**
3. **Before working on other electrical components, switch OFF power with the Main switch.**
4. **Never assume a circuit is without power - always test for power off with a meter.**

Work on live parts of the equipment must be authorized by supervision.

When performing such work, observe the following:

- Accident prevention rules
- Perform the following:
 - Use only suitable tools and measuring devices in good working condition.
 - Check the measuring devices for correct adjustment of measuring ranges.
 - Work with one hand only. This can prevent injury to internal organs in case of electrical shock.
 - Avoid contact with conducting floors (especially metal) or equipment parts. If necessary, cover the working area with suitable protective rubber mats.

Mechanical Maintenance

Observe the following:

- Location of the escape routes and emergency exits - keep these free of obstacles
- Keep dismantled machine components and other parts safe and inaccessible for unauthorized persons
- Keep the equipment clean during work; clean up carefully afterward

Before and after work, remove and reinstall all safety provisions installed for maintenance, such as:

- Covers
- Hazard alert messages
- Warning signs
- Grounding wires

Clothing must be in agreement with the safety rules. Clothing:

- Must not have metal fasteners
- Should be close-fitting so that it cannot be caught in moving machine parts
- Button up or roll up the sleeves.
- Place the ends of a scarf into the clothing.
- For long hair, use a protection that fully covers it.
- Take off watch, rings, and jewelry.

Wear safety glasses when:

- Using a hammer
- Using an electric drill
- Working on springs, and retaining rings.
- Soldering, working on cables
- Cleaning with chemical agents
- All work that endangers the eyes

When handling heavy components, wear safety shoes.

Refrain from any action that could endanger persons or that could damage installations or equipment.

Safety Check

Check all guards every six months:

- Door interlocks
- Tape Library access

Chapter 3. User Interfaces

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Operator Panel

The operator Panel provides an interactive path between Operator and the Tape Library. See Figure 3-1 for an illustration of the Operator Panel. Visual indications and push-buttons **6** enable the Operator to control the Tape Library.

The Tape Library Operator Panel is divided into five areas: I/O Station status **1**, library status **2**, messages **3**, drive status **4**, and softkeys **5**.

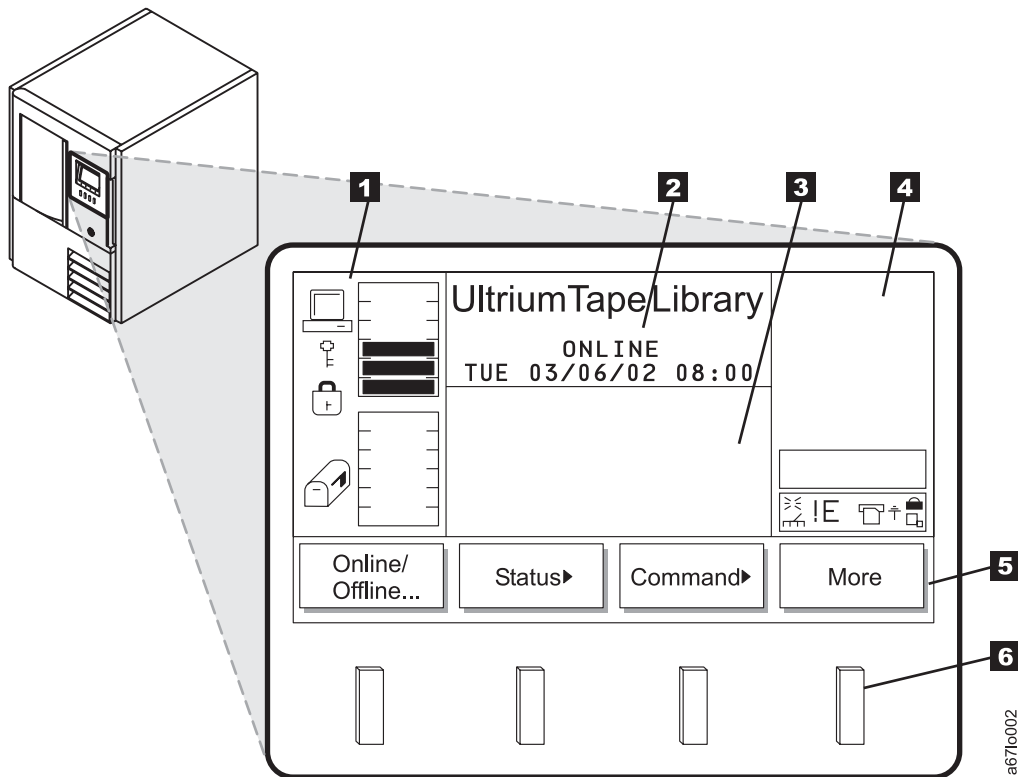


Figure 3-1. Operator Panel

I/O Station Status Area

The I/O Station status area provides constant information about the I/O Station. See **1** in Figure 3-2.

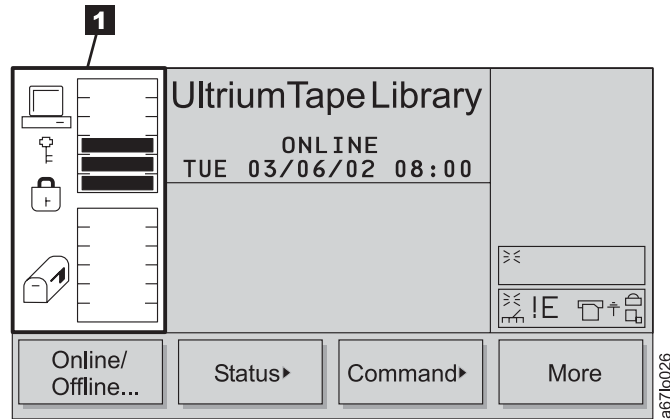




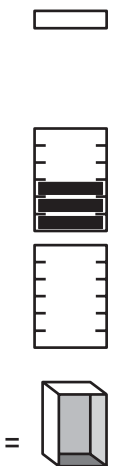


Figure 3-2. I/O Station Status Area

Table 3-1 on page 3-4 provides a description of the icons shown in the I/O Station status area.

Figure 3-2 on page 3-3 provides an illustration of the icons shown in the I/O Station status area.

Table 3-1. I/O Station Icons

Icon	Description
	<p>This icon is displayed on screen if the host has issued a PREVENT/ALLOW MEDIUM REMOVAL SCSI command and locked the I/O Station.</p>
 	<p>This icon is displayed on screen if the I/O Station is locked. The I/O Station can be locked by the following conditions.</p> <ul style="list-style-type: none"> • The host issues a PREVENT/ALLOW MEDIUM REMOVAL SCSI command and locks the I/O Station • The Tape Library is accessing an I/O Station slot. • The I/O Station has been configured as all storage. <p>This icon is displayed if the I/O Station is unlocked.</p>
	<p>These icons are displayed on screen for the six I/O Station states.</p> <p>State 1: The I/O Station door is closed. Any cartridge in the I/O Station has previously been inventoried.</p> <p>State 2: The I/O Station door is partially open. Any cartridge in the I/O Station has previously been inventoried.</p> <p>State 3: The I/O Station door is fully open. Any cartridge in the I/O Station has previously been inventoried. For an import operation, a cartridge can be inserted.</p> <p>State 4: The I/O Station door is closed. A cartridge has been exported and not yet removed.</p> <p>State 5: The I/O Station door is partially open. A cartridge has been exported and not yet removed.</p> <p>State 6: The I/O Station door is fully open. A cartridge has been exported and not yet removed. While in this state, an exported cartridge can be removed.</p>
	<p>These icons are displayed on screen to show the possible configurations of the I/O station.</p> <p>Type 1: A single slot I/O Station icon (available on the standard I/O station).</p> <p>Type 2: An I/O Station icon showing cartridges as indicated by the blackened out slots. A total of 12 slots are available (only available on the optional multiple I/O station feature).</p> <p>Type 3: A continuous storage icon. A total of 12 slots are available (only available on the optional multiple I/O station feature).</p>

Library Status Area

The library status area displays the current location, activity or state of the library. See **1** in Figure 3-3.

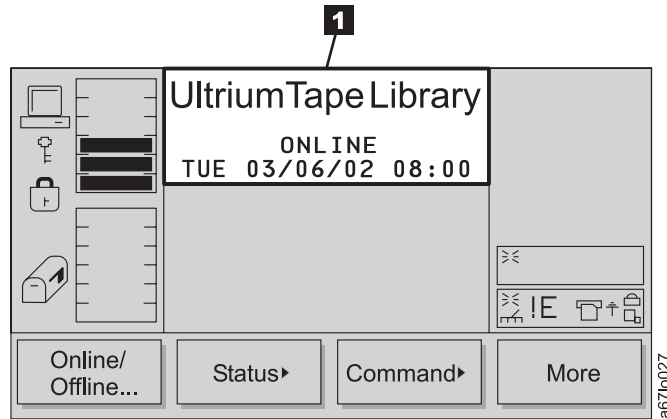


Figure 3-3. Library Status Area

Table 3-2 describes the text displayed in the library status area.

Table 3-2. Library Status Area

Text	Definition
OFFLINE	The media changer equipment is in an Offline state.
ONLINE	The media changer equipment is in an Online state.
Status or Attention Message	The library reports status or messages to solicit operator intervention.

Drive Status Area

The drive status area provides constant information about the drives. See **1** in Figure 3-4.

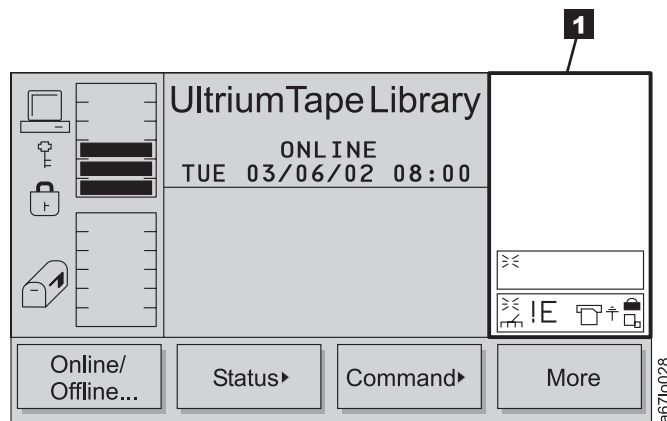

















Figure 3-4. Drive Status Area

Table 3-3 on page 3-6 provides a description of the icons shown in the drive status area.

Figure 3-4 on page 3-5 provides an illustration of the icons shown in the drive status area.

Table 3-3. Drive Status Icons

Status	Icon	Description
Drive Present		A tape drive is present but does not contain a cartridge.
Power On		If power is applied to the tape drive, the Power On icon is displayed.
Cleaning Required		If the tape drive cleaning is required, the Cleaning Required icon is displayed.
Error Code		If a drive error occurs, an error code displays. See Table 6-4 on page 6-25 for a list of drive error codes. "n" represents the character displayed, it can be: 0 – 9, or A, B, E, F, o, c, b, d, h or C.
Compression On		If the tape drive is compressing data on tape, the Compression On icon is displayed.
Write Protect		If the tape is write protected, the Write Protect icon is displayed.
Tape Activity		A tape drive is loading a cartridge.
		A tape drive has a cartridge loaded.
		A tape drive is rewinding a cartridge.
		A tape drive is unloading a cartridge.
		A tape drive has unloaded a cartridge.
		A tape drive is reading data from a cartridge.
		A tape drive is writing data to a cartridge.
		A tape drive is erasing data from a cartridge.
		A tape drive is locating data on a cartridge.

Message Area

The message area displays six lines of text, graphics representations, or a combination of both. See **1** in Figure 3-5. Each text line can be up to twenty characters long. These lines communicate interactive dialogs, special messages, alerts, error codes and library configurations.

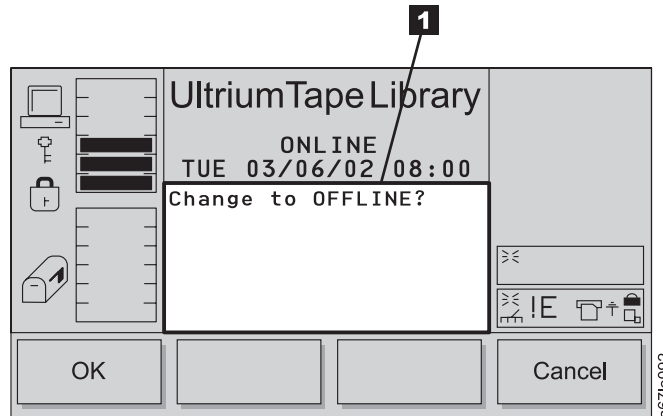


Figure 3-5. Messages Area

Operator/CE Panel Menus

Operator/CE panel allows information to be passed from Library to the Operator/CE and back to Library. Operator and CE communicates with Library via menus presented on the message display.

All menus are available to both Operator and CE.

All menus and respective options are grouped according to function. Special characters follow some respective options. The special characters following the softkey menu titles are described below.

- A keyword leading to another menu is followed by a black arrow. Example: **Move▶**
- A keyword leading to a dialog box is followed with three closely spaced dots. Example: **Move Media ...**
- A keyword leading to an immediate action has no suffix.
- Most fields on the menus, submenus, dialogs and screens are read only. The fields which are writable are in reverse video. Example: **ON**

RMU with TotalStorage Specialist

The Remote Management Unit (RMU) provides remote access to the Ultrium Scalable Tape Library over a network. You can attach the library to the network through a 10/100 Ethernet port on the RMU. Any server on the network can access the library if it has a web browser installed. All available functions are accessible without the need of a dedicated server or separate software. With the RMU and the TotalStorage Specialist software application you can access many of the functions that are described in the Operating Procedures chapter of the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.

- | **Note:** Operation of the library from a browser will be slower than using the operator panel.

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

TotalStorage Specialist Menu Description

The TotalStorage Specialist Home page is divided into three areas, the left navigation frame **1**, the center navigation frame **2**, and the top information frame **3** (see Figure 3-6).



Figure 3-6. TotalStorage Specialist home page

Top Information Frame

The top information frame (**3** in Figure 3-6) 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.

Left Navigation Frame

The left navigation frame (**1** in Figure 3-6 on page 3-8) contains hyperlinks that are described in the following list:

Logout	Logs out the current user and returns to the Status page.
Contents	Opens a page that displays a brief description of the tabs for Status, Configuration, Firmware, Diagnostic files, Operator panel, and Logs.
Documentation	Opens a page that contains links to the library's online documentation.
SNMP MIB	Opens a page that displays an explanation of the Simple Network Management Protocol (SNMP) management information base (MIB). This page also contains an option to download the SNMP MIB.
Support	Opens a page that displays contact information for technical support.
Version	Opens a page that displays the current version of the RMU's firmware.
www.ibm.com	Opens the Home page for the IBM web site.

Center Navigation Frame

The center navigation frame (**2** in Figure 3-6 on page 3-8) has the following tab-style hyperlinks:

- Status
- Configuration
- Firmware
- Diagnostics file
- Operator panel
- Logs

If you select a tab other than the Status tab, a login page displays (see Figure 3-7). The initial login name is admin and the initial password is secure.

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



Figure 3-7. Login Page

The following sections describe each tab-style hyperlink.

Status

The Status page displays the current status of the library. From this page you can easily see if there are problems with the system (see Figure 3-8).

IBM Ultrium Tape Library Specialist
Name: RASRMU (IBM ULT3583-TL)

Logout Status Configuration Firmware Diagnostics file Operator panel Logs

IBM ULT3583-TL

Library Status Offline [Click here for details](#)

Drive Status LTO: 4 drives

RMU User No current user

Hostname RASRMU

IP Address 192.1.1.101

MAC Address 00:30:8C:01:03:48

Library Serial # 0000078113151000

SNMP Off

SNMP Alerts Off

Library Firmware 6.01

RMU Firmware 190B.00003

www.ibm.com
Copyright 2001-2004

a671o177

Figure 3-8. Status page

The Status page is not protected by a password and is active even when you are not logged into the RMU. If you select any tab other than the Status tab, a login page displays (see Figure 3-9). The initial login name is admin and the initial password is secure.

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

IBM Ultrium Tape Library Specialist
Name: RMU (IBM ULT3583-TL)

Logout

IBM ULT3583-TL

No Current User.

Enter Login Name

Enter your password

Submit

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a671o178

Figure 3-9. Login Page

Configuration

The Configuration page is protected by a password and allows you to configure the remote management unit. Network configuration (including SNMP), user configuration (adding users, setting passwords), and date and time setup are all entered on this page (see Figure 3-10). The initial RMU network configuration is done through the library operator panel during library installation and setup (see the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*).

The screenshot shows the configuration page for the IBM Ultrium Tape Library Specialist. The browser title is "Remote Management Unit - Microsoft Internet Explorer" and the address bar shows "http://192.1.1.101". The page title is "Ultrium Tape Library Specialist" with the name "RASRMU (IBM ULT3583-TL)".

The configuration page is divided into several sections:

- Navigation:** Logout, Status, Configuration (selected), Firmware, Diagnostics file, Operator panel, Logs.
- Network Configuration:**
 - Hostname: RASRMU
 - IP Address: 192.1.1.101
 - Subnet Mask: 255.255.255.0
 - Gateway: 192.1.1.0
- SNMP Configuration:**
 - SNMP Enabled: OFF
 - Alerts Enabled: OFF
 - Manager (s): 0.0.0.0
 - Public Name: public
 - Private Name: private
- User Configuration:**
 - Management Action: No Action
 - User Name: admin
 - Password: [Empty]
 - Re-enter Password: [Empty]
- Date and Time:**
 - Date (mm/dd/yy): 01/24/05
 - Time (hh:mm): 13:32
 - Synchronization with NTP Server: OFF
 - NTP Server IP Address: 0.0.0.0
 - TimeZone: -07:00 (list of timezones)
- Reboot:**
 - Click here to reboot the RMU
 - Click here to reboot the Library

At the bottom of the configuration area are "Submit" and "Reset" buttons. The page footer includes "www.ibm.com" and "Copyright 2001-2004". A vertical label "a67to179" is visible on the right side of the browser window.

Figure 3-10. Configuration page

Firmware

The Firmware page (see Figure 3-11) is protected by a password and allows you to update the firmware of the attached library, the RMU, or the drives in the library. For instructions about updating firmware, see “Updating Firmware” on page 4-114.

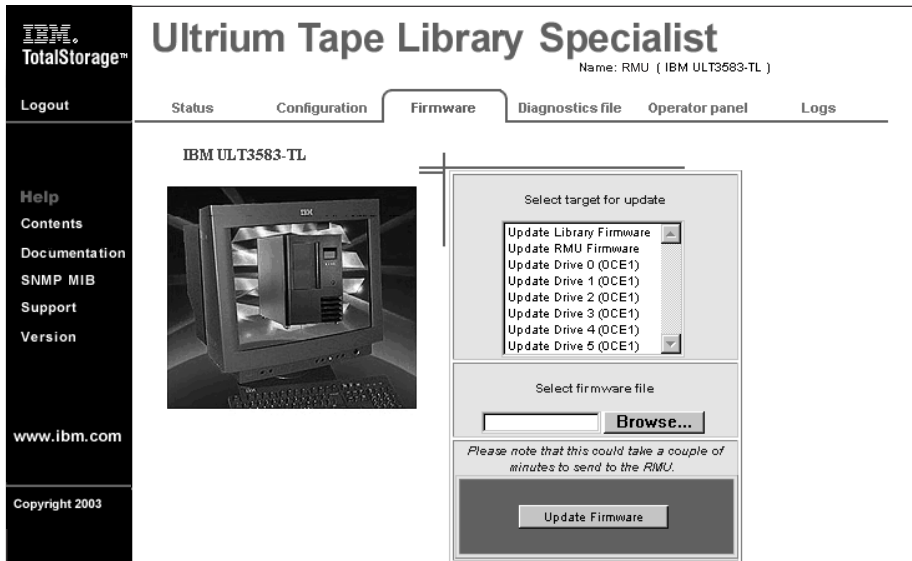


Figure 3-11. Firmware page

Diagnostics File

The Diagnostics file page is protected by a password and allows you to upload (to a local computer) the diagnostic information from the attached library. The diagnostic information may be useful to service personnel in diagnosing problems. Information from the library (command and error logs), information from the RMU (support and error log), and information from each installed drive (error and dump) can be retrieved in text form. The system snapshot is a machine-decodable file which can only be used by service personnel (see Figure 3-12).



Figure 3-12. Diagnostics file page

Operator Panel

The Operator panel page is protected by a password and is a direct interface to the operator panel of the attached library. It allows you to monitor the activity of the library. Any action that you perform (for example, pressing a button) is shown both on this page and on the attached library (see Figure 3-13).

IBM TotalStorage™

Ultrium Tape Library Specialist

Name: RMU (IBM ULT3583-TL)

Logout Status Configuration Firmware Diagnostics file **Operator panel** Logs

IBM ULT3583-TL

Help
Contents
Documentation
SNMP MIB
Support
Version

www.ibm.com

Copyright 2003

Ultrium Tape Library
ONLINE
TUE 04/24/02 08:00

Online/Offline.. Status Command More

a671b182

Figure 3-13. Operator panel page

Logs

The Logs page is protected by a password and shows the last few entries of the library command log (see Figure 3-14). To view the entire log, download it from the Diagnostics file page (see Figure 3-12 on page 3-13).



The screenshot displays the IBM StorWatch interface for the Ultrium Tape Library Specialist. The page title is "Ultrium Tape Library Specialist" with the name "Name: RMU (IBM ULT3583-TL)". The navigation menu includes "Logout", "Status", "Configuration", "Firmware", "Diagnostics file", "Operator panel", and "Logs". The "Logs" tab is selected. The main content area shows "IBM ULT3583-TL" and a "Current Command Log" with 15 entries. A small image of the tape library is visible on the left side of the log area. The left sidebar contains links for "Help", "Contents", "Documentation", "SNMP MIB", "Support", and "Version", along with the website "www.ibm.com" and "Copyright 2001".

IBM StorWatch

Ultrium Tape Library Specialist
Name: RMU (IBM ULT3583-TL)

Logout Status Configuration Firmware Diagnostics file Operator panel **Logs**

IBM ULT3583-TL

Current Command Log

```
000 ENDMC[26]: SCC OK 0 04/24/01 07:54:19
001 MC[26] SCC 04 820,BD-1234,AE0 04/24/01 07:54:10
002 ENDMC[25]: SCC OK 0 04/24/01 07:54:10
003 MC[25] SCC 04 AAE,1234-BD,AE0 04/24/01 07:54:00
004 ENDMC[24]: SCC OK 0 04/24/01 07:54:00
005 MC[24] SCC 04 30C,BD-1234,AE0 04/24/01 07:53:51
006 ENDMC[23]: SCC OK 0 04/24/01 07:53:51
007 MC[23] SCC 04 59E,662-BD,AE0 04/24/01 07:53:46
008 ENDMC[22]: IVV OK 00,00,00 04/24/01 07:53:45
009 MC[22] IVV 01 2B0,112D-112D,ACE 04/24/01 07:53:41
010 ENDMC[21]: SCC OK 0 04/24/01 07:53:41
011 MC[21] SCC 04 59E,721-1234,AE0 04/24/01 07:53:34
012 ENDMC[20]: MER OK 00,00,4B5 04/24/01 07:53:33
013 MC[20] MER 03 AAE,11EC-11EC,AB5 04/24/01 07:53:30
014 ENDMC[1F]: MER OK 00,00,4B5 04/24/01 07:53:29
```

www.ibm.com
Copyright 2001

a671c183

Figure 3-14. Logs page

Chapter 4. Operating Procedures

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

If You Want To Do This...	Go To Page...
Add or remove control paths	14-45
Calibrate the library	4-101
Choose the method of inventory	4-72
Clean a drive	4-49
Clear the drive's error log	4-31
Configure the I/O station as storage slots	14-47
Copy a drive dump	4-34
Create or erase an FMR tape	4-105
Disable security	4-77
Enable and disable backlighting and audio	4-71
Enable or disable automatic cleaning	4-49
Enable security	14-49
Exercise the library	4-95
Export a cartridge from the library	4-56
Extend VOLSER length	4-107
Force a drive dump	4-32
Import a cartridge into the library	4-47
Move a cartridge	4-38
Move the picker	4-41
Partition the physical library into a logical library	4-48
Perform a demonstration of the library	4-95
Perform an inventory of the library	4-43
Perform a self test of the library	4-97
Perform a verify test of the library	4-99
Remove or replace a tape drive	4-107
Reset a tape drive	4-59
Resolve errors	4-80
Run drive diagnostics	4-103
Run library diagnostics	4-82
Scan media in drives	4-54
Select the online or offline state	4-5
Set up remote communication with the library	4-61

Unload a cartridge from a drive	4-58
Update drive, library, and RMU firmware	4-114
Upload library error log information by using the RMU	4-113
Use the Main Menu	4-4
If You Want To Change This...	Go To Page...
Date and time	4-68
Drive SCSI ID	4-64
Drive FC ID	4-66
Password	14-50
If You Want To Check This...	Go To Page...
Functionality of the bar code reader	4-88
Get and put capability of the picker	4-83
Homing capability of the picker	4-94
Motion patterns of the picker	4-90
Movement of the picker	4-90
Open, close, reach, and retract capabilities of the picker	4-87
Step capability of the picker	4-92
Sensors and locking or unlocking of the I/O station door	4-82
If You Want To View This...	Go To Page...
Drive SCSI ID	4-64
Drive FC ID	4-66
Drive status	4-17
Library status and usage	4-15
Storage slot status and usage	4-18
Cartridge locations	4-23
Information about a drive	4-17
Information about a storage slot	4-19
Command log	4-25
Drive error log	4-30
Feature license	4-79
Library serial number and firmware level	4-110

Flowchart of Library Functions

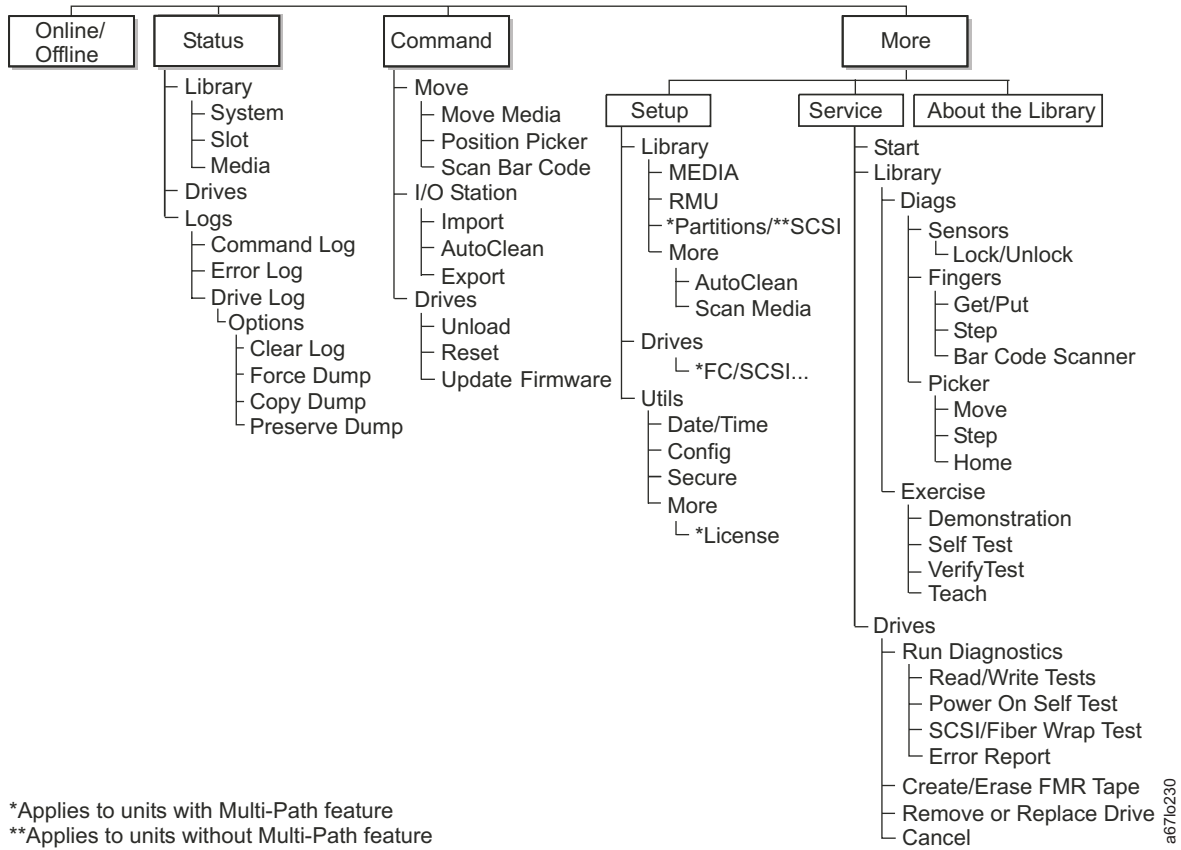


Figure 4-1. Flowchart of library functions

Using the Main Menu

The Main Menu is the first interactive menu that displays after you turn on the power. The Main Menu consists of two screens: the initial screen and the alternate screen. You can select all subsequent menus and options from these two screens. Figure 4-2 shows the Main Menu's initial screen and Figure 4-3 shows the Main Menu's alternate screen.

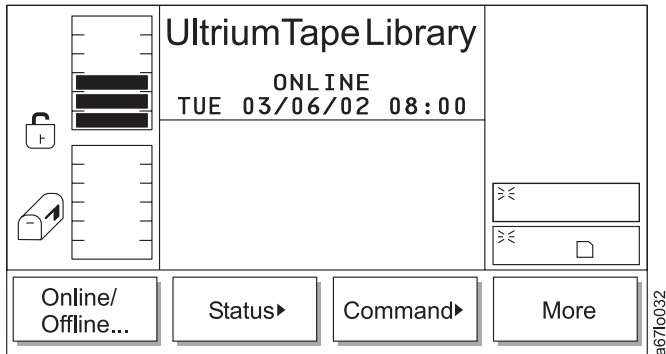


Figure 4-2. Main Menu (initial screen)

To display the Main Menu's alternate screen, press the button below the **More** softkey. The alternate screen displays (see Figure 4-3).

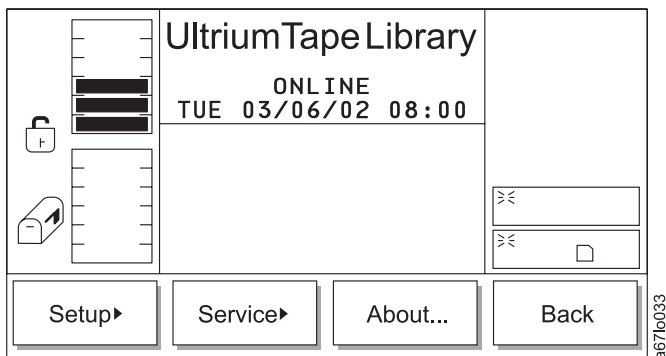


Figure 4-3. Main Menu (alternate screen)

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

Selecting the Online or Offline State

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

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

Performing Functions That Require an Offline State

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

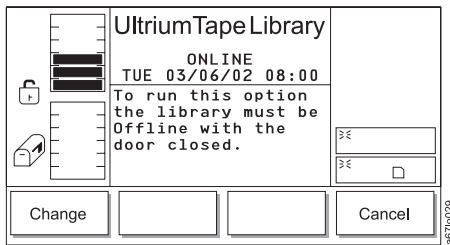


Figure 4-4. Change Dialog

Press the button below the **Change** softkey. The Offline Confirmation Dialog displays (see Figure 4-5).

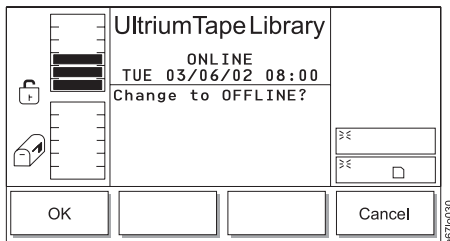


Figure 4-5. Offline Confirmation Dialog

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

Accessing the Status Menu

To access the Status Menu:

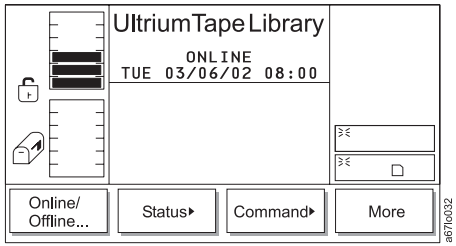


Figure 4-6. Main Menu (initial screen)

From the Main Menu's initial screen, press the button below the **Status** softkey. The Status Menu displays (see Figure 4-7).

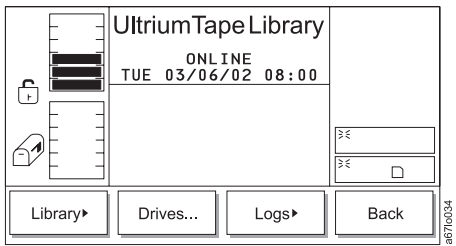


Figure 4-7. Status Menu

Accessing the Command Menu

To access the Command Menu:

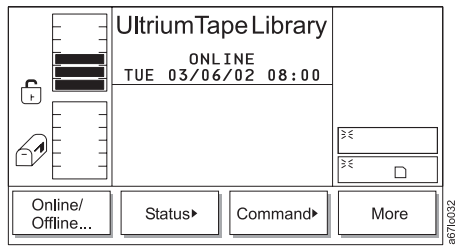


Figure 4-8. Main Menu (initial screen)

From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 4-9).

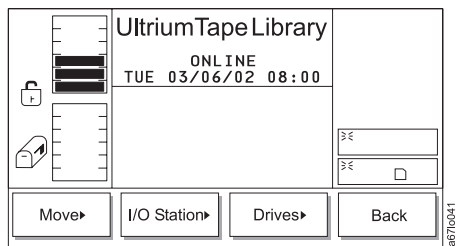


Figure 4-9. Command Menu

Accessing the Setup Menu

To access the Setup Menu:

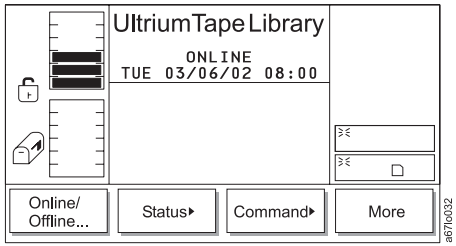


Figure 4-10. Main Menu (initial screen)

From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 4-11).

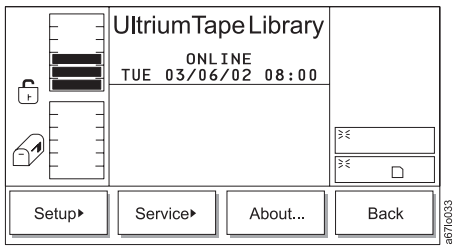


Figure 4-11. Main Menu (alternate screen)

Press the button below the **Setup** softkey. The Setup Menu displays (see Figure 4-12).

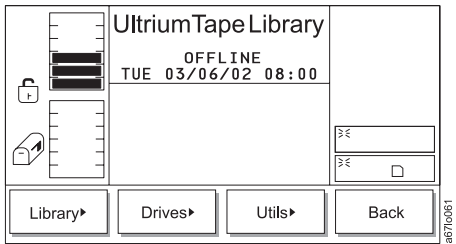


Figure 4-12. Setup Menu

Accessing the Service Menu

To access the Service Menu:

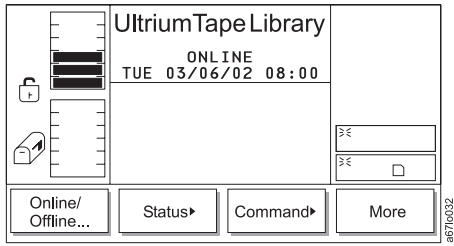


Figure 4-13. Main Menu (initial screen)

From the Main Menu's initial screen (see Figure 4-13), press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 4-14).

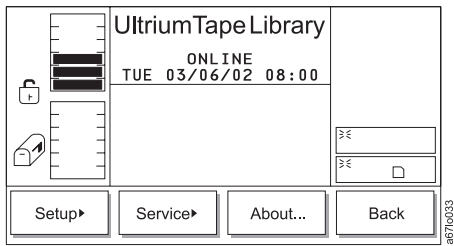


Figure 4-14. Main Menu (alternate screen)

Press the button below the **Service** softkey. The Service Menu displays (see Figure 4-15).

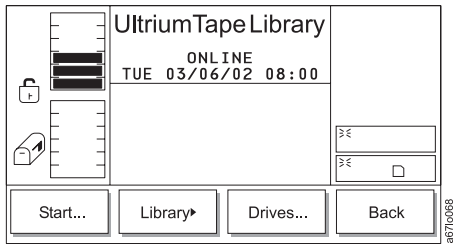


Figure 4-15. Service Menu

Accessing the About the Library (About...) Menu

To access the About.. Menu:

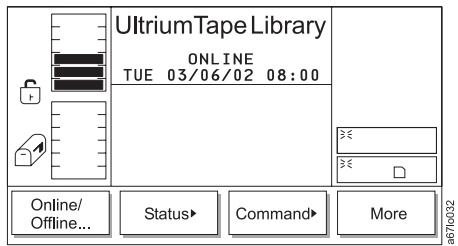


Figure 4-16. Main Menu (initial screen)

From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 4-17).

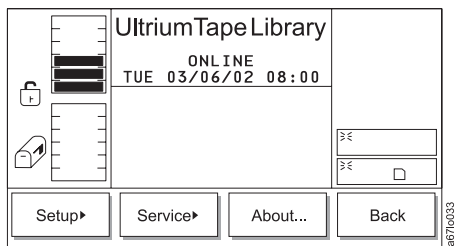


Figure 4-17. Main Menu (alternate screen)

Press the button below the **About** softkey. The About Menu displays the library's serial number and current version of firmware (see Figure 4-18).

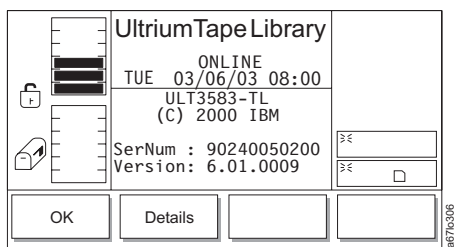


Figure 4-18. About Menu

Operator Intervention Message

If a problem causes an operator intervention message to appear, see Table 6-2 on page 6-19 for an explanation of the parameters in the message.

Operator Information Message

During the course of normal operation, operator information messages appear. See "Operator Information Messages" on page 6-24 for a list of the available messages.

Turning on the Power to the Tape Library

Perform the following to start the Ultrium Scalable Tape Library:

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



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

2. Push I on the main power switch (**1** in Figure 4-19) to turn on the power.



Figure 4-19. Main power switch

Power is applied to the tape library. The firmware starts the boot process with an introductory splash screen (see Figure 4-20).

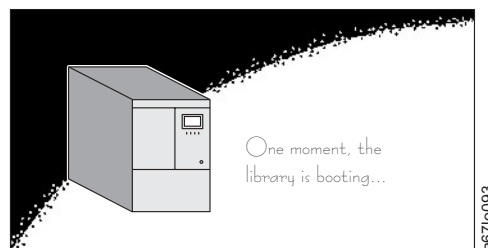


Figure 4-20. Splash screen

The firmware initiates a SELF-TEST, TEACH (auto-configuration), and SCANNING operation. After all of the firmware procedures are completed, the operator panel displays the Main Menu (initial screen) (see Figure 4-21).

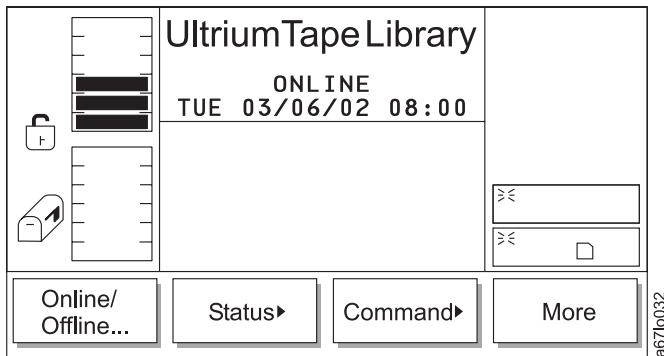


Figure 4-21. Main Menu (initial screen)

Shutting Down the Tape Library

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

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

Performing a Normal Shutdown

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

1. Ensure that all cartridges are removed from the drives and are stored in the library's storage slots.
2. Push O on the main power switch (**1** in Figure 4-19 on page 4-11) to turn off the power. Power is removed from the tape library.

Performing an Emergency Shutdown

Attention: Perform the following in cases of emergency only.

Push O on the main power switch (**1** in Figure 4-19 on page 4-11) to turn off power. Power is removed from the tape library. All picker movements stop immediately.

Restarting the Tape Library

Perform the following to restart the Ultrium Scalable Tape Library:

1. If applicable, correct any conditions that required a shutdown of the tape library.
2. See “Turning on the Power to the Tape Library” on page 4-11 for instructions about powering-on the tape library.

Inserting Media

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

Inserting Media Through the I/O Station

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

1. Open the door of the I/O station.
2. Insert the cartridge into an empty storage slot.
3. Close the door of the I/O station. The library locks the I/O station and executes the TEACH and INVENTORY procedures for column 1. It then unlocks the I/O station.
4. Move the cartridge to the desired storage slot by using one of the following methods:
 - Use the server’s software application.
 - Issue the SCSI MOVE MEDIUM command from the server, with the source I/O station element address and the destination storage element address.
 - Refer to the procedure in “Importing a Cartridge into the Library” on page 4-47.
 - Refer to the procedure in “Moving a Cartridge” on page 4-38.

Inserting Media Directly into the Tape Library

Attention: Do not use this method to insert a cleaning cartridge into the library. To insert a cleaning cartridge, see “Enabling and Disabling Automatic Cleaning” on page 4-49.

To directly insert media, perform the following procedure:

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

Removing Media

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

Removing Media Through the I/O Station

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

1. Select the cartridges that you want to move to the I/O station by using one of the following methods:
 - Use the server's software application.
 - Issue a SCSI MOVE MEDIUM command from the server with the source storage element address and the destination I/O station element address.
 - Refer to the procedure in "Exporting a Cartridge from the Library" on page 4-56.
 - Refer to the procedure in "Moving a Cartridge" on page 4-38.
2. Open the door of the I/O station.
3. Remove the cartridge from the storage slot.
4. Close the door of the I/O station.

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

Removing Media Directly from the Tape Library

Attention: Do not use this method to remove a cleaning cartridge from the library. To remove a cleaning cartridge, see "Enabling and Disabling Automatic Cleaning" on page 4-49.

To directly remove media, perform the following procedure:

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

The library executes the TEACH and INVENTORY procedures.

Viewing Library Status and Usage

Library status and usage can be viewed via the RMU and the Operator Panel.

From the Web

The status page displays the current status of the library. From this page you can easily see if there are problems with the system (see Figure 4-22).

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



The screenshot shows the IBM Ultrium Tape Library Specialist web interface. The page title is "Ultrium Tape Library Specialist" with the name "Name: RASRMU (IBM ULT3583-TL)". The navigation menu includes "Status", "Configuration", "Firmware", "Diagnostics file", "Operator panel", and "Logs". The "Status" page displays the following information:

IBM ULT3583-TL	
Library Status	Offline Click here for details
Drive Status	LTO: 4 drives
RMU User	No current user
Hostname	RASRMU
IP Address	192.1.1.101
MAC Address	00:30:8C:01:03:48
Library Serial #	0000078113151000
SNMP	Off
SNMP Alerts	Off
Library Firmware	6.01
RMU Firmware	190B.00003

Additional elements in the screenshot include a sidebar with "Logout", "Help", "Contents", "Documentation", "SNMP MIB", "Support", "Version", and "www.ibm.com". A copyright notice "Copyright 2001-2004" is visible at the bottom left. A vertical text "a6716177" is located on the right side of the page.

Figure 4-22. Status page

From the Operator Panel

To view the quantity of occupied and empty storage slots, I/O station slots, and drives in the library, perform the following steps. This procedure also allows you to determine usage statistics for the library.



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

1. Navigate to the Status Menu. For instructions, see "Accessing the Status Menu" on page 4-6.

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-23).

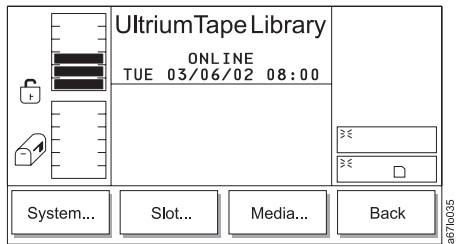


Figure 4-23. Library Submenu

3. Press the button below the **System** softkey. The System Dialog displays (see Figure 4-24). The screen gives the quantity of full (occupied) and empty storage slots, I/O station slots, and drives.

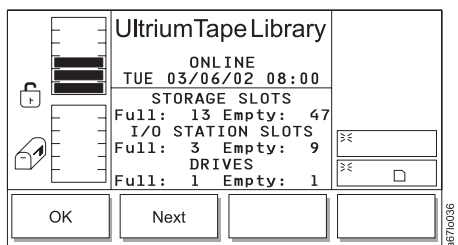


Figure 4-24. System Dialog

4. To view usage statistics for the library, press the button below the **Next** softkey. The Statistics Dialog displays (see Figure 4-25) with the following information:

- Moves** The lifetime number of slot-to-slot moves.
- I/O accessed** The lifetime number of times that the door of the I/O station has opened.
- Get retries** The lifetime number of recovery tries on get operations.
- Put retries** The lifetime number of recovery tries on put operations.
- Scan retries** The lifetime number of recovery retries on scan operations.

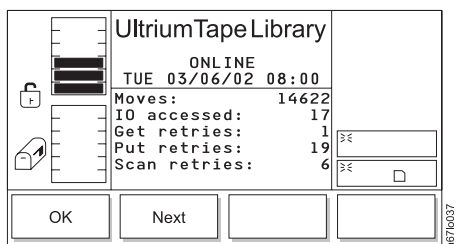


Figure 4-25. Statistics Dialog

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

Viewing Drive Status

To view the quantity and location of occupied and empty drives in the library, refer to the icons on the operator panel.

Viewing Information about a Drive

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



Shortcut: Main Menu (initial screen) → Status → Drives → Change Drive

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Drives** softkey. The Drives Dialog displays (see Figure 4-26).

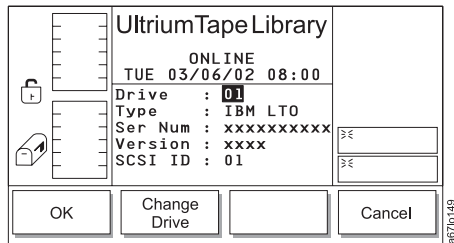


Figure 4-26. Drives Dialog

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

- Drive** The number of the drive. The number is based on the location of the drive in the drive column. The numbers range from 01 to 06, from bottom to top.
- Type** The type of the drive (IBM LTO).
- Ser Num** The serial number of the drive.
- Version** The level of firmware installed in the drive.
- SCSI ID** The SCSI ID of the drive.

3. To view the information about another drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays in the Drive field. The screen automatically refreshes with information about that drive.
4. To return to the Status Menu, press the button below the **OK** or **Cancel** softkey. To return to the Main Menu press the button below the **OK** or **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Viewing Storage Slot Status and Usage

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

To view the locations of cartridges in the library, see “Viewing Information about a Storage Slot” on page 4-19.



Shortcut: Main Menu (initial screen) → Status → Library → System

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-27).

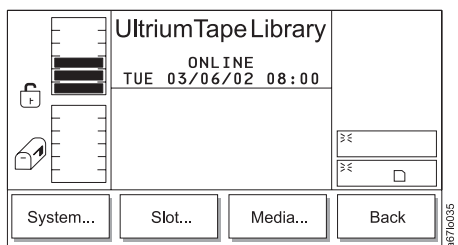


Figure 4-27. Library Submenu

3. Press the button below the **System** softkey. The System Dialog displays (see Figure 4-28). The screen gives the number of full (occupied) and empty storage slots. It also lists the number of full and empty I/O station slots and drives.

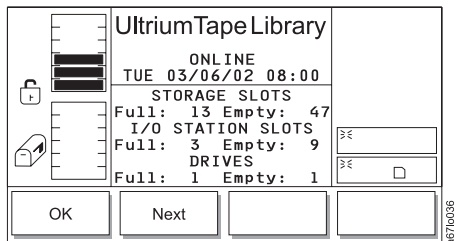


Figure 4-28. System Dialog

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

Viewing Information about a Storage Slot

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



Shortcut: Main Menu (initial screen) → Status → Library → Slot

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-29).

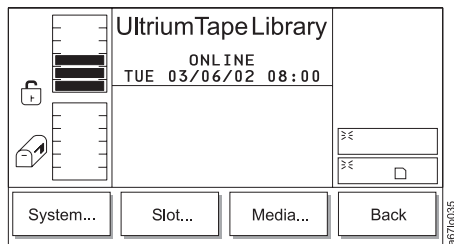


Figure 4-29. Library Submenu

3. Press the button below the **Slot** softkey. The Slot Dialog displays (see Figure 4-30) with a message area that shows three icons.

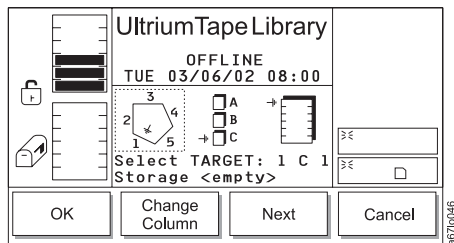


Figure 4-30. Slot Dialog

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

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 1, magazine C, and storage slot 1 indicate a physical address of 1 C 1. In the Slot Dialog, a slot's physical address displays below the right icon (see Figure 4-30).

4. Perform one of the following:

- To view information about the currently selected storage slot, press the button below the **OK** softkey. The Slot Status Dialog displays (see Figure 4-33 on page 4-21).
- To view information about another storage slot, specify its physical address by performing the following steps:
 - a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 4-31).

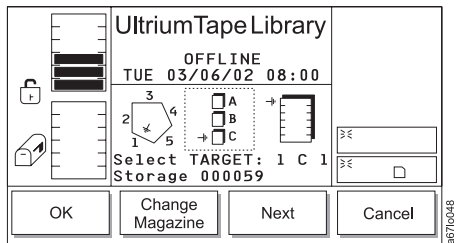


Figure 4-31. Change Magazine Dialog

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

- b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the button below the **Next** softkey. The Change Slot Dialog displays (see Figure 4-32).

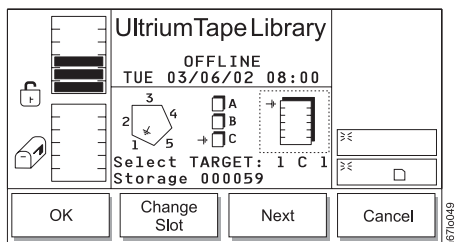


Figure 4-32. Change Slot Dialog

- c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.
- d. Perform one of the following:
 - To accept the physical address of storage slot (located below the right icon), press the button below the **OK** softkey.
 - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The screen similar to the Slot Status Dialog displays (see Figure 4-33 on page 4-21). The screen shows the new 3-character address that you specified.

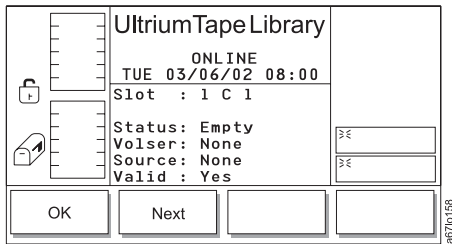


Figure 4-33. Slot Status Dialog. If you specified another slot, the new address displays in the Slot field.

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

- Slot** The three-position physical address of the storage slot. Represented as x y z, where x equals the number of the column, y equals the number of the magazine, and z equals the number of the storage slot.
- Status** Indication of whether the cartridge is present (Full) or not present (Empty).
- Volser** Bar code number of the cartridge in the storage slot (the bar code number is also called the volume serial number). If no cartridge is present in the slot, the value of this field is None.
- Source** Element address of the cartridge in the storage slot (see “Element Addressing” on page C-1). If no cartridge is present, the value of this field is None.
- Valid** Indication of whether the slot can (Yes) or cannot (No) be used.

To return to the Slot Dialog (see Figure 4-30 on page 4-19), press the button below the **OK** softkey.

5. To view information about put and get operations for the slot, press the button below the **Next** softkey. The Put/Get Information screen displays (see Figure 4-34).

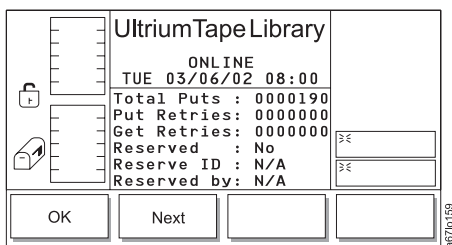


Figure 4-34. Put/Get Information

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

- Total Puts** Total put operations.
- Put Retries** Number of put retry operations.
- Get Retries** Number of get retry operations.
- Reserved** Indication of whether the slot is reserved (Yes) or not reserved (No) by a SCSI host.
- Reserve ID** The identifier for the slot reservation that was made by the SCSI host.
- Reserved by** The identifier of the host that reserved the slot.

To return to the Slot Dialog (see Figure 4-30 on page 4-19), press the button below the **OK** softkey.

6. To view the coordinates that the X-, Y-, and Z-axes use to move cartridges to and from the selected slot, press the button below the **Next** softkey. The Position Dialog displays (see Figure 4-35 on page 4-22).

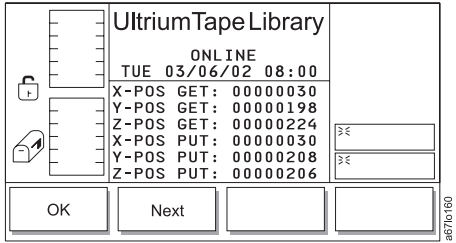


Figure 4-35. Position Dialog

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

- X-POS GET** Rotary coordinate that the picker uses to retrieve a cartridge from the selected slot.
- Y-POS GET** Vertical coordinate that the picker uses to retrieve a cartridge from the selected slot.
- Z-POS GET** Horizontal coordinate that the picker uses to retrieve a cartridge from the selected slot.
- X-POS PUT** Rotary coordinate that the picker uses to insert a cartridge into the selected slot.
- Y-POS PUT** Vertical coordinate that the picker uses to insert a cartridge into the selected slot.
- Z-POS PUT** Horizontal coordinate that the picker uses to insert a cartridge into the selected slot.

7. To return to the Slot Status Dialog (see Figure 4-33 on page 4-21), press the button below the **Next** softkey. To return to the Slot Dialog (see Figure 4-30 on page 4-19), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** → **Cancel** → **Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Viewing Cartridge Locations

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



Shortcut: Main Menu (initial screen) → Status → Library → Media

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-36).

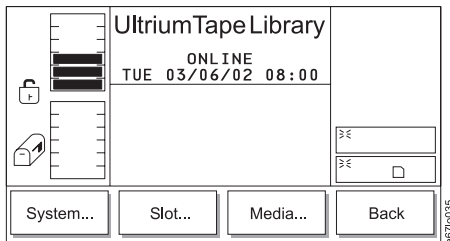


Figure 4-36. Library Submenu

3. Press the button below the **Media** softkey. The Media Dialog displays a list of tape cartridges in the library by their VOLSERs and their locations (see Figure 4-37). The location is a 3-character physical address (x y z) where x equals the number of the column, y equals the number of the magazine, and z equals the number of the storage slot.

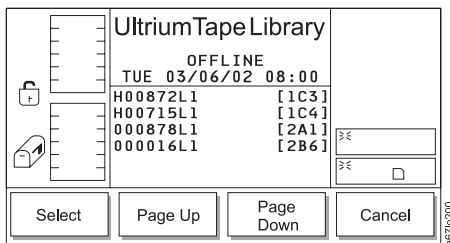


Figure 4-37. Media Dialog

- Press the button below the **Page Up** or **Page Down** softkey to locate the cartridge that you want, then press the button below the **Select** softkey. The Select Media Dialog displays with a selection bar that lets you choose a cartridge (see Figure 4-38).

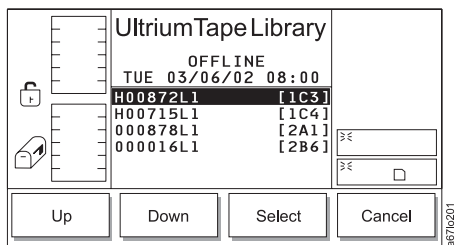


Figure 4-38. Select Media Dialog

- Press the button below the **Up** or **Down** softkey to move the selection bar and highlight the cartridge that you want, then press the button below the **Select** softkey. The Media Information Dialog displays (see Figure 4-39).

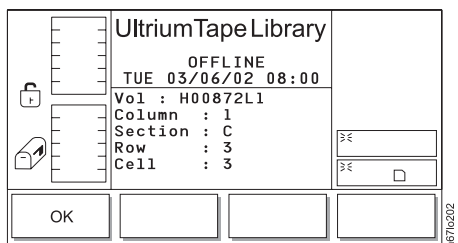


Figure 4-39. Media Information Dialog

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

- Volser** Bar code number.
- Column** Number of the column that contains the cartridge.
- Section** Letter of magazine that contains the cartridge.
- Row** Number of storage slot that contains the cartridge.
- Cell** The location of a storage slot in the library, as counted continuously from the top slot in the I/O station to the bottom of the last column in the library.

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

Viewing the Command Log

The Command Log can be viewed via the RMU or the Operator Panel.

From the Web

The logs page is protected by a password and shows the most recent entries in the library command log (see Figure 4-40). To view the entire log, download it from the diagnostics file page (see Figure 3-12 on page 3-13).



Figure 4-40. Diagnostics file page

From the Operator Panel

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

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



Shortcut: Main Menu (initial screen) → Status → Logs → Command Log

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.

2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 4-41).

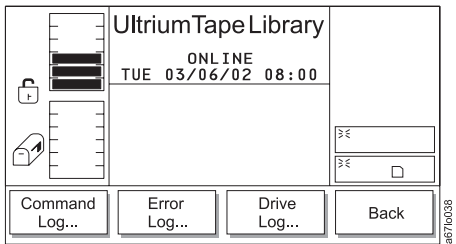


Figure 4-41. Logs Submenu

3. Press the button below the **Command Log** softkey. The Command Log Dialog displays the date and time of the most recent library operation and any message text (see Figure 4-42). The screen presents one operation at a time. For each operation, the date is shown as mm/dd/yy, where mm equals the month, dd equals the day, and yy equals the year. The time is shown as hh:mm:ss, where hh equals the hour, mm equals the minute, and ss equals the second. The message text is useful to Engineering only.

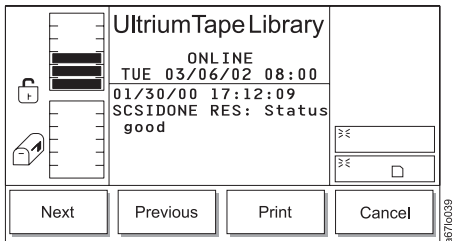


Figure 4-42. Command Log Dialog

4. Press the button below the **Previous** or **Next** softkey to view the date and time of the previous or next command operation in the log.
5. Perform one of the following:
 - To return to the Logs Submenu, press the button below the **Cancel** softkey.
 - To print the command log, press the button below the **Print** softkey. The Print Dialog displays (see Figure 4-43). Press the button below the **OK** softkey to send the log to your printer. After the operation is complete, the screen refreshes. To return to the Logs Submenu, press the button below the **Cancel** softkey.

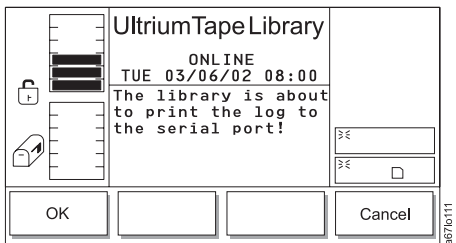


Figure 4-43. Print Dialog

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

Viewing the Library's Error Log

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

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



Shortcut: Main Menu (initial screen) → Status → Logs → Error Log

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 4-44).

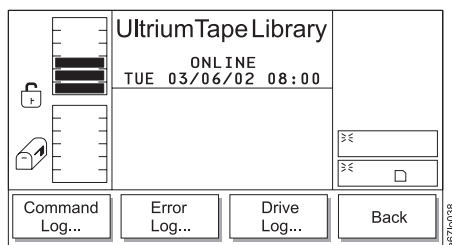


Figure 4-44. Logs Submenu

3. Press the button below the **Error Log** softkey. The Error Log Dialog displays (see Figure 4-45).

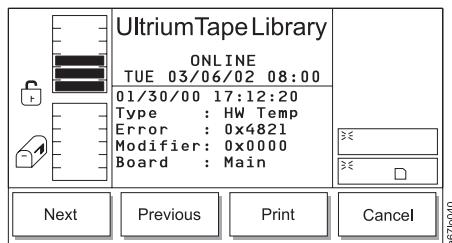


Figure 4-45. Error Log Dialog

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

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

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

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

Error A hexadecimal number that is useful to Engineering only.

Modifier A hexadecimal number that is useful to Engineering only.

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

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

- To return to the Logs Submenu, press the button below the **Cancel** softkey.
- To print the error log, press the button below the **Print** softkey. The Print Dialog displays (see Figure 4-46). Press the button below the **OK** softkey to send the log to your printer. After the operation is complete, the screen refreshes. To return to the Logs Submenu, press the button below the **Cancel** softkey.

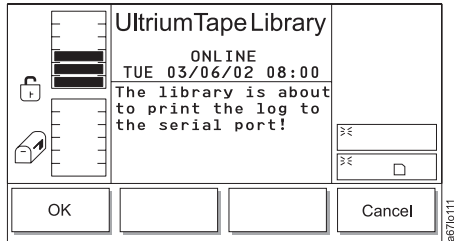


Figure 4-46. Print Dialog

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

Adding or Removing Control Paths

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



Shortcut: Main Menu (initial screen) → More → Setup → Drives → SCSI...

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 4-47).

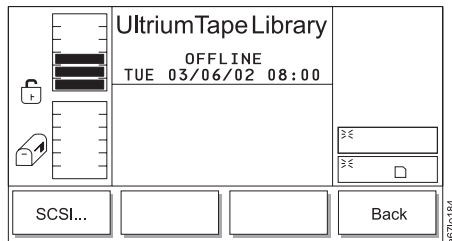


Figure 4-47. Drives Submenu

3. Press the button below the **FC/SCSI** softkey. The FC/SCSI submenu displays (see Figure 4-48). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the Drive: field. The Control path field indicates whether the drive is a control path. Valid values are OFF or ON.

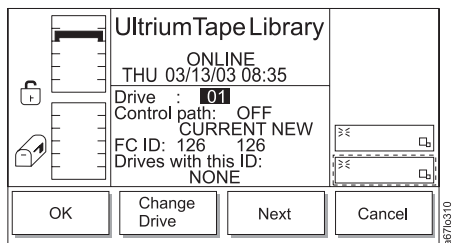


Figure 4-48. FC/SCSI Submenu

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

Viewing the Drive's Error Log

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



Shortcut: Main Menu (initial screen) → Status → Logs → Drive Log

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.
2. Press the button below the **Logs** softkey. The Logs Submenu displays (see Figure 4-49).

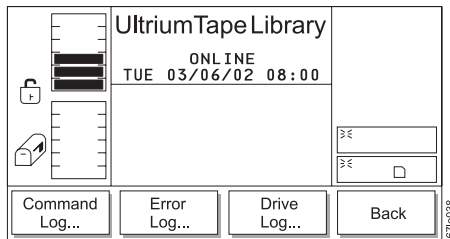


Figure 4-49. Logs Submenu

3. Press the button below the **Drive Log** softkey. The Select Drive Dialog displays (see Figure 4-50).

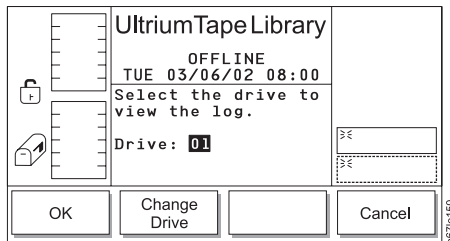


Figure 4-50. Select Drive Dialog

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

The Drive Log Dialog displays (see Figure 4-51).

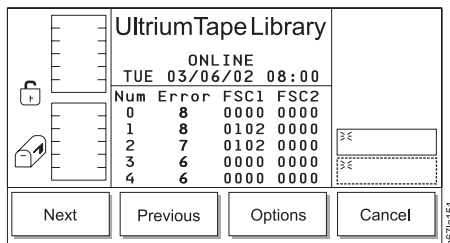


Figure 4-51. Drive Log Dialog

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

- Num** The ID of the error.
- Error** The type of error, as defined in “Drive Error Codes” on page 6-25.
- FSC1** Fault symptom code 1. This information is useful to Engineering only.
- FSC2** Fault symptom code 2. This information is useful to Engineering only.

5. Press the button below the **Previous** or **Next** softkey to view information about previous or additional drive errors in the log.
6. To return to the Logs Submenu (see Figure 4-49 on page 4-30), press the button below the **Cancel** softkey. To return to the Main Menu, press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Clearing the Drive’s Error Log

To erase (clear) the current drive’s error log, perform the following steps:



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

1. Specify the drive that you want by performing steps 1 through 5 in “Viewing the Drive’s Error Log” on page 4-30. The Drive Log Dialog displays (see Figure 4-52).

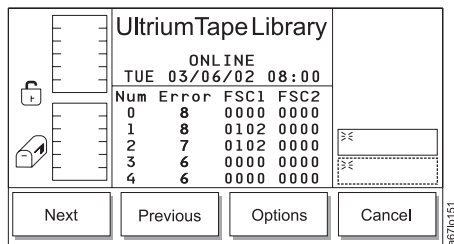


Figure 4-52. Drive Log Dialog

- Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 4-53).

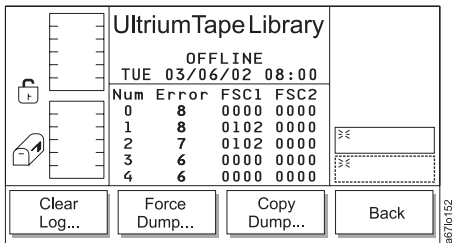


Figure 4-53. Drive Error Log Options Submenu

- Press the button below the **Clear Log** softkey. The library displays the message **This option will clear the current drive log contents.**
- Press the button below the **OK** softkey. The drive clears its error log and displays the message **Requested command is now complete.**
- To return to the Drive Error Logs Options Submenu (see Figure 4-53), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK → Back → Cancel → Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Forcing a Drive Dump

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

From the Operator Panel

To force a drive dump, perform the following steps.



Shortcut: Main Menu (initial screen) → Status → Logs → Drive Log → OK (or Change Drive) → Options → Force Dump

- Specify the drive that you want by performing steps 1 through 5 in “Viewing the Drive’s Error Log” on page 4-30. The Drive Log Dialog displays (see Figure 4-54).

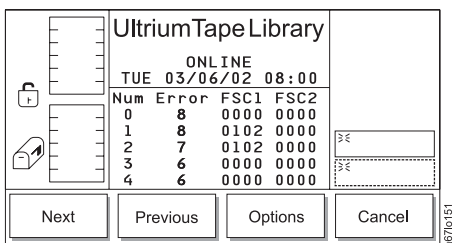


Figure 4-54. Drive Log Dialog

2. Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 4-55).

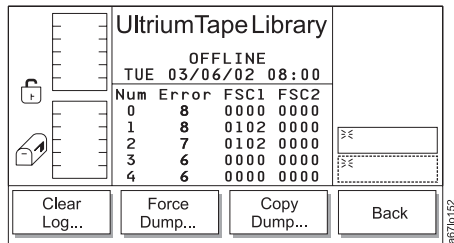


Figure 4-55. Drive Error Log Options Submenu

3. Press the button below the **Force Dump** softkey. The library displays the message **This option will force a drive dump.**
4. Press the button below the **OK** softkey. The drive forces the dump and displays the message **Requested command is now complete.** To obtain the dump, see “Copying a Drive Dump to Tape Cartridge Using the Operator Panel” on page 4-34.
5. To return to the Drive Error Logs Options Submenu (see Figure 4-55), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK → Back → Cancel → Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Copying a Drive Dump

Copying a Drive Dump to the Server Using the LTO-TDX Tool

The tool, LTO-TDX, is the fastest method (approximately 5 seconds) for uploading LTO drive error dumps (the current dump and a forced dump). In addition, this tool can be used to download LTO drive firmware across the SCSI bus or fibre channel. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO Gen 1, Gen 2, and Gen 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. Upload a dump of the drive firmware logs from the drive to a computer system
 - b. Download firmware to the drive (see “**Firmware download function**” on page 4-127)
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 shall 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 to make sure the drive is not in use when firmware is downloaded or a dump is taken. He also must remove any cartridge 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, the tool will inform the user that there are none before closing the tool window.

Drive 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 month, day, hours, minutes, 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.

Copying a Drive Dump to Tape Cartridge Using the Operator Panel

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

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



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

1. Specify the drive that you want by performing steps 1 through 5 in "Viewing the Drive's Error Log" on page 4-30. The Drive Log Dialog displays (see Figure 4-56).

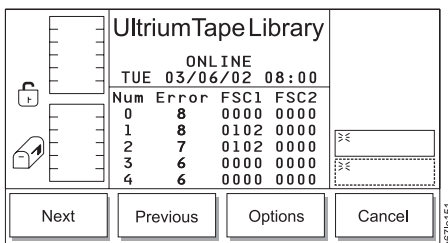


Figure 4-56. Drive Log Dialog

2. Press the button below the **Options** softkey. The Drive Error Log Options Submenu displays (see Figure 4-57 on page 4-35).

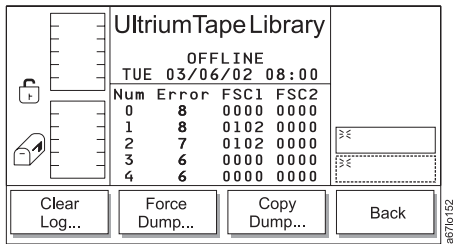


Figure 4-57. Drive Error Log Options Submenu

3. Press the button below the **Copy Dump** softkey. The Copy Dump Dialog prompts you to insert a scratch cartridge into the top I/O station slot.
4. After you insert the cartridge, press the button below the **OK** softkey. A message indicates that the command is in progress while the picker moves the cartridge from the I/O station to the drive. After the drive copies the dump to the tape, the picker returns the cartridge to the I/O station and displays the message **Requested command is now complete**.
5. To return to the Drive Error Log Options Submenu (see Figure 4-57), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** → **Back** → **Cancel** → **Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Copying a Drive Dump to the Server Using the RMU

Copying a drive dump using the RMU is a very slow process (average copying time is over 1 hour). To copy a drive dump using the RMU, follow these steps:

1. Open the RMU interface using an Internet browser. The Status page will display.



Figure 4-58. Status page

2. Click on the Diagnostic file tab and the Login page will display.



Figure 4-59. Login page

3. Enter your Login Name and password and click on Submit. The Diagnostics file page will display.



Figure 4-60. Diagnostics file page

4. Select "Drive x Dump" (x being the number of the desired drive) and click on Retrieve selected file. The dump will be saved in a file on the server.

Copying a Drive Dump Using SCSI Communication (TAPEUTIL and NTUtil)

Refer to the *IBM Ultrium Device Drivers Installation and User's Guide (GA32-0430)* for instructions on usage of the TAPEUTIL (Unix) and NTUtil (Windows) utilities for the particular Operating System that the library is attached to.

Performing a Preserve Dump

Note: This procedure applies to LTO-3 drives only.

To aid in failure analysis for LTO-3 tape drives, prior to **removing** the failing drive and while the power is still enabled to the drive, it is very important to preserve any available drive dump that may be in the active dump area in the drive memory.

To force a drive dump, perform the following steps.



Shortcut: Main Menu (initial screen) → Status → Logs → Drive Log → OK (or Change Drive) → Options → More → Preserve Dump

1. Specify the drive that you want by performing steps 1 through 5 in “Viewing the Drive’s Error Log” on page 4-30. The Drive Log Dialog displays (see Figure 4-61).

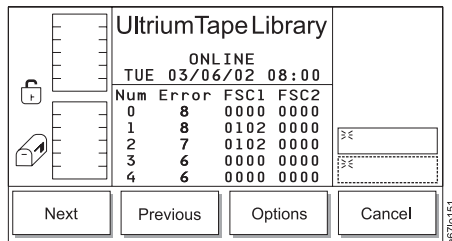


Figure 4-61. Drive Log Dialog

2. Press the button below the **More** softkey. The Drive Error Log Options Submenu displays (see Figure 4-62).

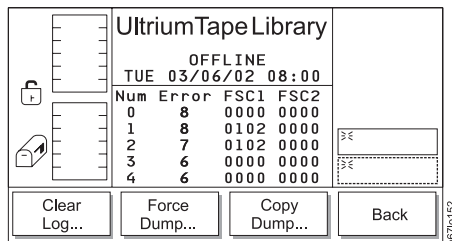


Figure 4-62. Drive Error Log Options Submenu

3. Press the button below the **Preserve Dump** softkey.
4. Press the button below the **OK** softkey to initiate the test. An informational message is displayed to indicate that the operation is in progress. Wait until the operation completes before removing the drive.
5. To return to the Drive Error Logs Options Submenu (see Figure 4-62), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK → Back → Cancel → Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Moving a Cartridge

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



Shortcut: Main Menu (initial screen) → Command → Move → Move Media

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 4-63).

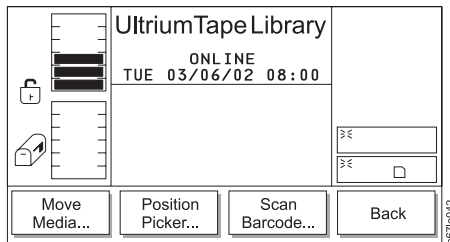


Figure 4-63. Move Submenu

3. Press the button below the **Move Media** softkey. The Source Move Media Dialog displays (see Figure 4-64) with a message area that shows three icons:

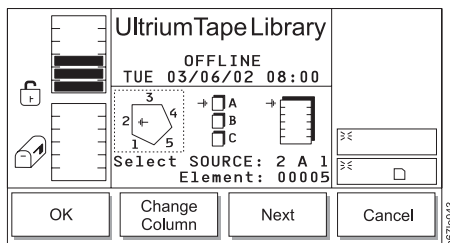


Figure 4-64. Source Move Media Dialog

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

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Source Move Media Dialog, a slot's physical address displays below the right icon (see Figure 4-64).

4. Specify the cartridge that you want to move by performing one of the following:
 - To move the cartridge from the physical address that is currently displayed, press the button below the **OK** softkey.
 - To move a cartridge from another location, specify its physical address by performing the following steps:
 - a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 4-65 on page 4-39).

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

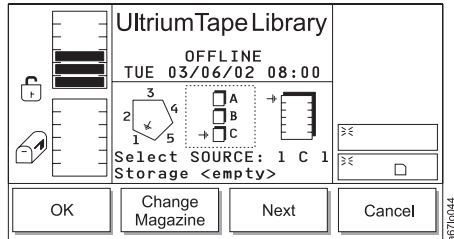


Figure 4-65. Change Magazine Dialog

- b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 4-66).

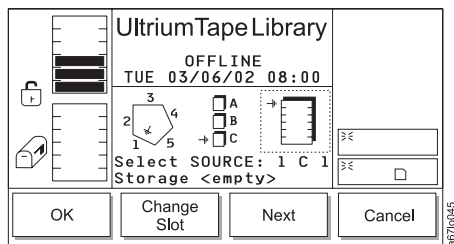


Figure 4-66. Change Slot Dialog

- c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.
- d. Perform one of the following:
 - To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.
 - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The Target Move Media Dialog displays (see Figure 4-67).

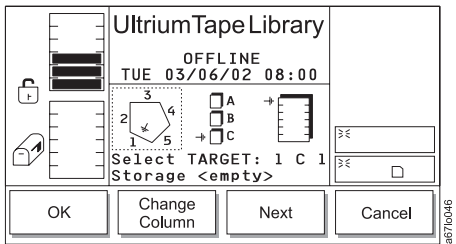


Figure 4-67. Target Move Media Dialog

5. Specify where you want the cartridge to be moved by repeating steps 4a through 4d. The library moves the cartridge from the source address to the target address and displays the message **Requested command is now complete.**
6. To return to the Move Submenu (see Figure 4-63 on page 4-38), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Moving the Picker

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



Shortcut: Main Menu (initial screen) → Command → Move → Position Picker

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 4-68).

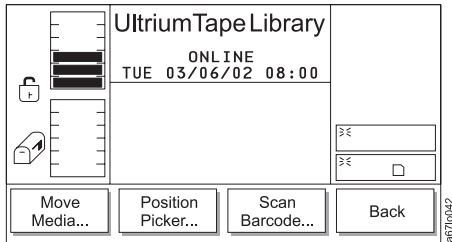


Figure 4-68. Move Submenu

3. Press the button below the **Position Picker** softkey. The Position Picker Dialog displays (see Figure 4-69) with a message area that shows three icons:

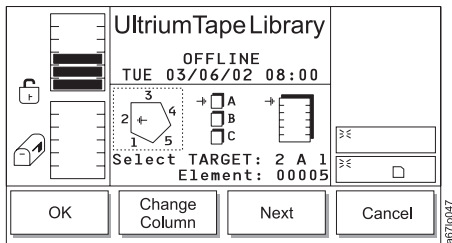


Figure 4-69. Position Picker Dialog

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

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Position Picker Dialog, a slot's physical address displays below the right icon (see Figure 4-69).

4. Specify where you want the library to move the picker by performing one of the following:
 - To move the picker to the address that is currently displayed, press the button below the **OK** softkey.
 - To move the picker to another location, specify the physical address by performing the following steps:
 - a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 4-70 on page 4-42).

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

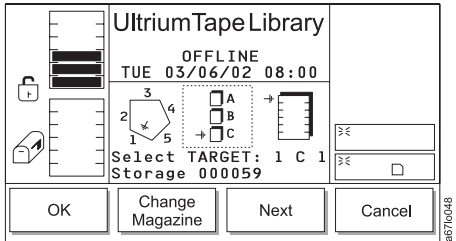


Figure 4-70. Change Magazine Dialog

- b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 4-71).

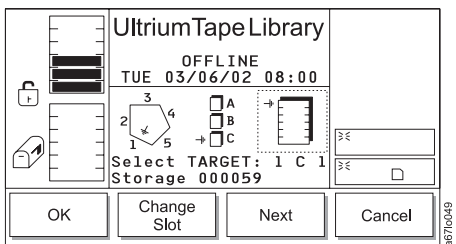


Figure 4-71. Change Slot Dialog

- c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.
- d. Perform one of the following:
 - To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.
 - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

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

5. To return to the Move Submenu (see Figure 4-68 on page 4-41), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Performing an Inventory of the Library

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

Note: To change how the library performs the inventory (by scanning labeled cartridges or touching unlabeled cartridges), see “Choosing the Method of Inventory” on page 4-72.



Shortcut: Main Menu (initial screen) → Command → Move → Scan Barcode

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **Move** softkey. The Move Submenu displays (see Figure 4-72).

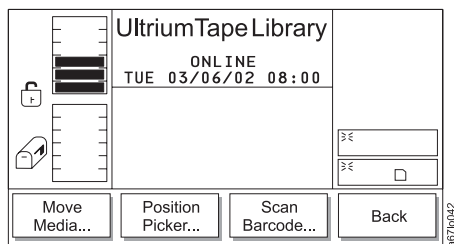


Figure 4-72. Move Submenu

3. Press the button below the **Scan Barcode** softkey. The Scan Barcode Dialog displays (see Figure 4-73) with a message area that shows three icons:

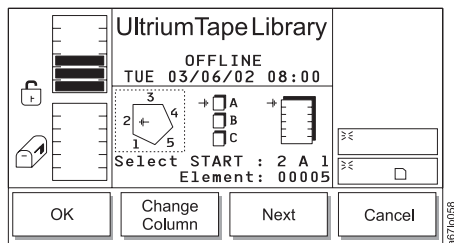


Figure 4-73. Scan Barcode Dialog

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

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Scan Barcode Dialog, a slot's physical address displays below the right icon (see Figure 4-73).

4. Specify the storage slot at which you want the inventory to begin by performing one of the following:
 - To begin the inventory at the physical address that is currently displayed, press the button below the **OK** softkey.
 - To begin the inventory at another location, specify the physical address by performing the following steps:

- a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 4-74).

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

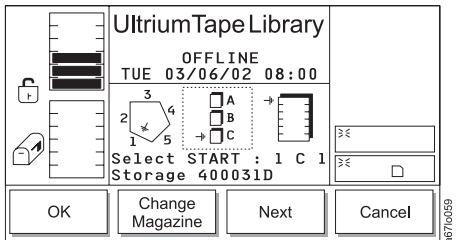


Figure 4-74. Change Magazine Dialog

- b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the button below the **Next** softkey. The Change Slot Dialog displays (see Figure 4-75).

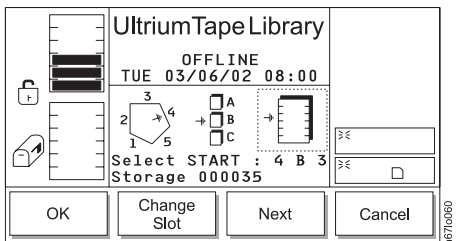


Figure 4-75. Change Slot Dialog

- c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.
 - To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.
 - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.

The Select Slots Dialog displays the quantity of slots to inventory (see Figure 4-76).

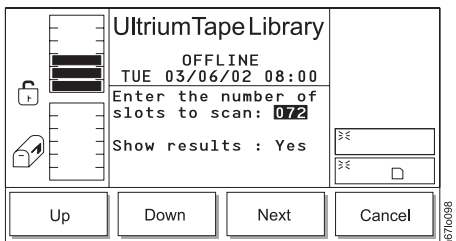


Figure 4-76. Select Slots Dialog

Note: To perform a cartridge inventory of the entire library (I/O Station, all storage slots and installed tape drives), leave the column, magazine and slot coordinates on column 1, magazine C, and slot 1. To perform a cartridge inventory of the 12 slot I/O Station and installed drives, choose column 1, magazine A, and slot 1. Choosing a slot other than 1 and/or magazine B will reduce the number of I/O Station slots inventoried. To choose a cartridge inventory of the installed drives, choose column 3. All other choices will start the inventory at the storage slot chosen and add to it the I/O Station slots and the installed drives. The maximum locations that will be inventoried for any possible coordinates selection will be initially listed in the "slots to scan" field in the Select Slots dialog screen. for example, if the library contains a full complement of columns (4) and a full complement of tape drives (6), the "slots to scan" field would be $72 + 6 = 78$. The operator may reduce this number to alter the stopping point.

- To specify the quantity of slots to inventory, press the button below the **Up** or **Down** softkey to increase or decrease the value in the field. The maximum number of slots that can be inventoried is 72. Press the button below the **Next** softkey. The Confirm Dialog displays (see Figure 4-77).

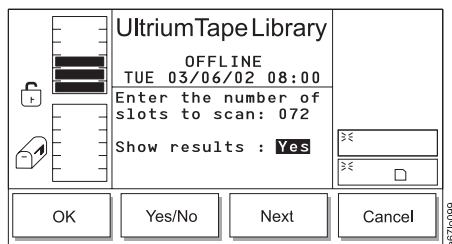


Figure 4-77. Confirm Dialog

- To specify whether you want the results of the inventory to display on the operator panel, press the button below the **Yes/No** softkey until Yes or No displays in the Show results field.
- To start the inventory, press the button below the **OK** softkey. The library begins the inventory at the physical address that you specified. After the inventory is done, one of the following occurs:
 - If you chose not to display the results, the library displays the message **Requested command is now complete.**

- If you chose to display the results, the Completion Dialog displays (see Figure 4-78). The screen shows the quantity of cartridges that were found in the storage slots, I/O station, and drives.

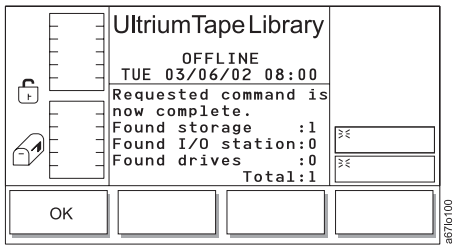


Figure 4-78. Completion Dialog

8. To return to the Move Submenu (see Figure 4-72 on page 4-43), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Importing a Cartridge into the Library

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



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

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 4-79).

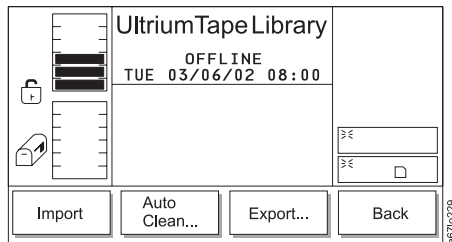


Figure 4-79. I/O Station Submenu

3. Press the button below the **Import** softkey. The picker moves the cartridge to the first available empty slot and the library displays the message **Requested command is now complete.**
4. To return to the I/O Station Submenu (see Figure 4-79), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Partitioning the Library

You can partition the Ultrium Scalable Tape Library into a maximum of three logical libraries. If your application supports it, Ultrium 1, Ultrium 2, and Ultrium 3 drives and media are allowed in the same logical library. Partitioning is possible only after you have installed drives that have the control path enabled.

Performing the Partitioning Process

To partition the library, perform the following steps.



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

The Partitions Dialog displays the number of logical libraries that are currently partitioned (see Figure 4-80).

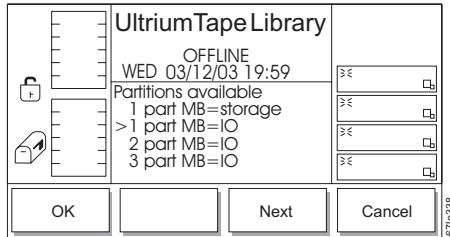


Figure 4-80. Partitions Dialog

The Partition Dialog contains the following information:

- part** The quantity of logical libraries in the library. Valid values are from 1 to 3.
- MB** Indicates that the I/O station is configured as storage or as an I/O station. Valid values are storage and I/O.

Perform one of the following:

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

Enabling and Disabling Automatic Cleaning

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

Notes:

1. Automatic cleaning is a function that needs to be enabled..
2. Automatic cleaning is incompatible with host/application based cleaning. Turn off the cleaning function in the application and export the cleaning tapes. The server stops all cleaning inquiries to the drive.
3. You cannot enable automatic cleaning if you have configured the slots in the I/O station as storage slots.

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



**Shortcut: Main Menu (initial screen) → More → Setup → Library
→ More → AutoClean**

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-81).

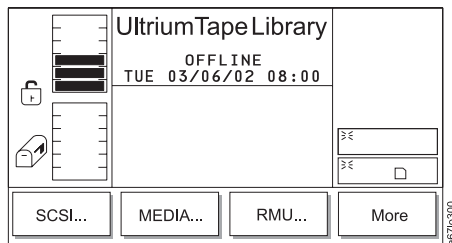


Figure 4-81. Library Submenu

3. Press the button below the **More** softkey. The More Dialog displays (see Figure 4-82).

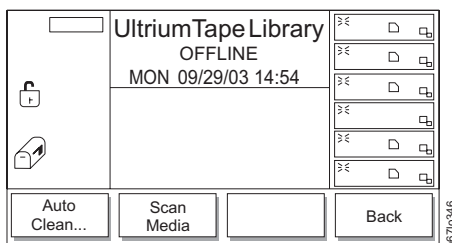


Figure 4-82. More Dialog

4. Press the button below the **AutoClean** softkey. The Autoclean Setup screen displays (see Figure 4-83).

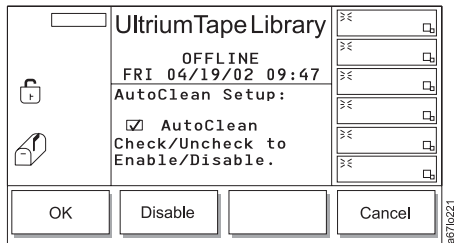


Figure 4-83. Autoclean Setup screen

5. Perform one of the following:
 - To enable automatic cleaning, press the button below the **Enable** softkey until the screen displays a checkmark in the checkbox beside the AutoClean field. The checkmark indicates that automatic cleaning is currently enabled.
 - To disable automatic cleaning, press the button below the **Disable** softkey until the checkmark disappears from the checkbox. The absence of a checkmark means that automatic cleaning is currently disabled.
6. Press the button below the **OK** softkey. The library enables or disables automatic cleaning and redisplay the More Dialog (see Figure 4-82 on page 4-49).
7. Perform one of the following:
 - To return to the Setup Menu (see Figure 4-12 on page 4-8), press the button below the **Back** softkey.
 - To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Importing the Cleaning Cartridge

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

Before you import a cleaning cartridge, make sure that autoclean is enabled (see “Enabling and Disabling Automatic Cleaning” on page 4-49).



Shortcut: Main Menu (initial screen) → Command → I/O Station → AutoClean → Import

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 4-84).

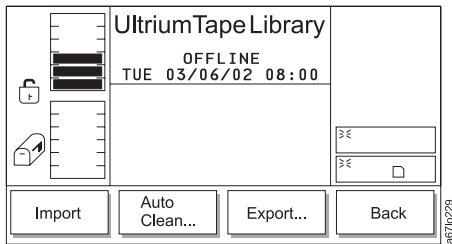


Figure 4-84. I/O Station Submenu

3. Press the button below the **AutoClean** softkey. The AutoClean Dialog displays (see Figure 4-85) with the following information about cleaning cartridges and cleaning slots in the library.

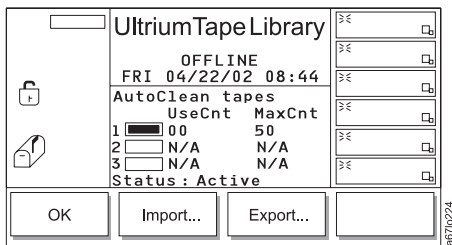


Figure 4-85. AutoClean Dialog

- 1
- 2
- 3

Represents the quantity of storage slots that are designated for a cleaning cartridge. A cleaning slot is located at the top of columns 2, 4, and 5. In the AutoClean Dialog, slot 1 refers to the slot in column 2, slot 2 refers to the slot in column 4, and slot 3 refers to the slot in column 5. A shaded box means that the slot is occupied; a box that contains no shading means that the slot is empty.

UseCnt The number of times that the cleaning cartridge has been used to clean a drive. Valid values are 0 through 99, or EXP for an expired cartridge.

MaxCnt The number of times that the cleaning cartridge can be used to clean a drive. Valid values are 50 (the maximum) or EXP for an expired cartridge. Values in the MaxCnt column are read only.

Status Indicates whether the AutoClean function is currently enabled (Active) or disabled (Inactive).

- If no cleaning cartridge is present in the library (each of the three rectangular boxes contain no shading), import a cleaning cartridge by pressing the button below the **Import** softkey. The Cleaning Tape screen displays (see Figure 4-86).

Note: The Import softkey is only available if there are empty cleaning cartridge storage slots.

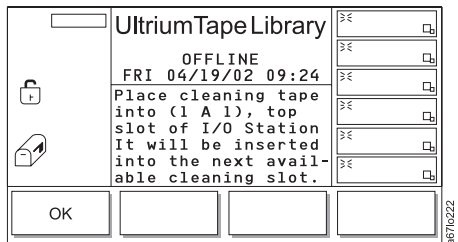


Figure 4-86. Cleaning Tape screen

- Open the door of the I/O station and place a cleaning cartridge into the top slot of the I/O station. Use only the top slot of the I/O station.
- Close the door of the I/O station. The library executes the TEACH and INVENTORY procedures and places the cleaning cartridge in the first available cleaning cartridge location..
- Press the button below the **OK** softkey. The library imports the cleaning cartridge to the drive and cleaning begins. When the cleaning is finished, the library displays the message **Requested command is now complete.**
- Perform one of the following:
 - To return to the AutoClean Dialog, press the button below the **OK** softkey.
 - To return to the Main Menu press the button below the **OK** softkey twice, then press the button below the **Back** softkey until the Main Menu displays.

Handling Errors

For a list of cleaning cartridge error messages and actions required, refer to “Cleaning Cartridge Error Messages” on page 6-30.

Exporting the Cleaning Cartridge

To export a cleaning cartridge, perform the following procedure.

Before you export a cleaning cartridge, make sure that autoclean is enabled (see “Enabling and Disabling Automatic Cleaning” on page 4-49).



Shortcut: Main Menu (initial screen) → Command → I/O Station → AutoClean → Export

- Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 4-87).

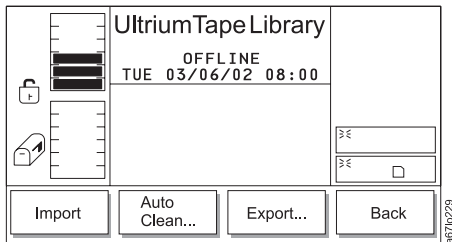


Figure 4-87. I/O Station Submenu

3. Press the button below the **AutoClean** softkey. The AutoClean Dialog displays (see Figure 4-88).

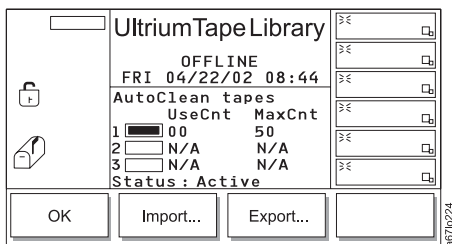


Figure 4-88. AutoClean Dialog

4. Press the button below the **Export** softkey. The Export Cleaning Tape Dialog displays (see Figure 4-89).

Note: The Export softkey is only available if at least one cleaning cartridge has been detected.

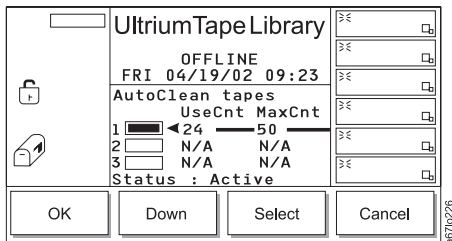


Figure 4-89. Export Cleaning Tape Dialog

5. Press the button below the **Up** or **Down** softkey to specify the cleaning slot that you want, then press the button below the **Select** softkey. The library exports the cleaning cartridge from the slot that you specified to a slot in the I/O station. When the export is finished, the library displays the message **Requested command is now complete.**
6. Perform one of the following:
 - To return to the AutoClean Dialog, press the button below the **OK** softkey.
 - To return to the Main Menu press the button below the **OK** softkey twice, then press the button below the **Back** softkey until the Main Menu displays.
7. Remove the cleaning cartridge from the I/O station.
8. Press the button below the **Online/Offline** softkey to place the library in the online state.

Scan Media in Drives

Scan Media configures your library to read and store the bar code number of media currently in tape drives when running a library inventory on a power sequence or after opening and then closing the library's main door..



Shortcut: Main Menu (initial screen) → More → Setup → Library
→ More → Scan Media

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Scan Media** softkey (see Figure 4-90).

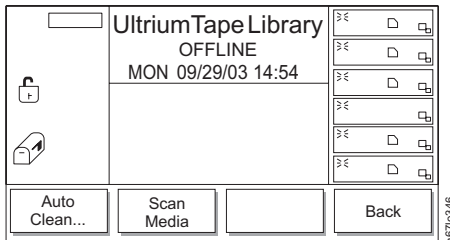


Figure 4-90. More Submenu

3. In the Scan Media Dialog, select a value for each of the fields displayed in the table below by pressing the button below the **Yes/No** softkey.

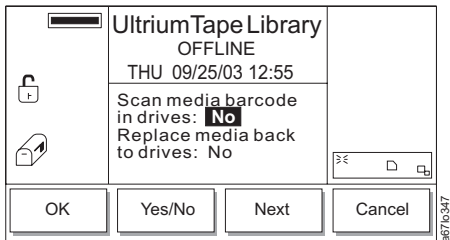


Figure 4-91. Scan Media Dialog

Field	Value	Description
Scan media bar code in drives	Yes	Media in drives are unloaded and placed into storage slots so that their bar codes can be scanned as part of inventory.
	No	Media are left in drives and are not scanned.
Replace media back to drives	Yes	Media are moved back to their original drive slots after their bar codes are scanned.
	No	Media are left in their storage slots after their bar codes are scanned.

4. Press the button below the **OK** softkey to accept the values selected.
5. Perform one of the following:

- To return to the Setup Menu (see Figure 4-12 on page 4-8), press the button below the **Back** softkey.
- To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Exporting a Cartridge from the Library

To export a tape cartridge from the library to the I/O station, perform the following steps. You can select a maximum of 12 tape cartridges during a single export operation.



Shortcut: Main Menu (initial screen) → Command → I/O Station → Export

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 4-92).

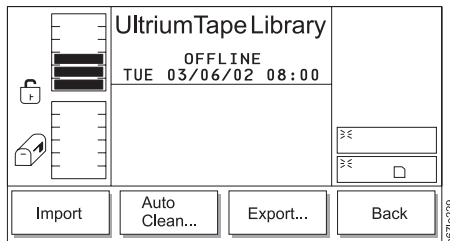


Figure 4-92. I/O Station Submenu

3. Press the button below the **Export** softkey. The Export Dialog displays a message that describes the export procedure (see Figure 4-93).

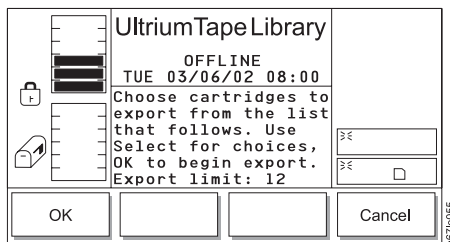


Figure 4-93. Export Dialog

4. Press the button below the **OK** softkey. The Export List Dialog displays a list of tape cartridges that are present in the library (see Figure 4-94). The cartridges are listed by their volume serial numbers (VOLSERs) and physical addresses.

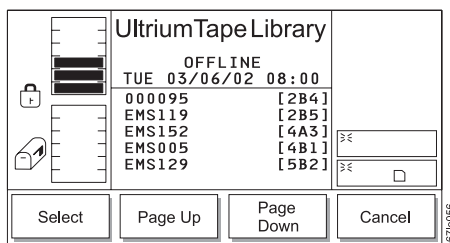


Figure 4-94. Export List Dialog

5. Press the button below the **Page Up** or **Page Down** softkey to locate the screen that contains the cartridge that you want, then press the button below the **Select** softkey. The selection cursor displays beside the first item on the screen (see Figure 4-95 on page 4-57).

Note: To return to the Export List Dialog to make additional selections or cancel the export operation, press the button below the **Pages** softkey.

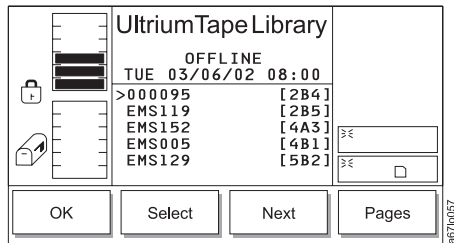


Figure 4-95. Export Select Dialog

6. Perform one or both of the following:
 - To export the first cartridge in the list, press the button below the **Select** softkey to highlight and select the cartridge.
 - To export a cartridge other than the first one in the list, press the button below the **Next** softkey to move the selection cursor to the cartridge that you want. Press the button below the **Select** softkey to highlight and select the cartridge. You can highlight and select up to 12 cartridges at a time.
7. Press the button below **OK** softkey. The picker moves the cartridge that you specified to the I/O station and the library displays the message **Requested command is now complete.**
8. To return to the I/O Station Submenu (see Figure 4-92 on page 4-56), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Unloading a Cartridge from a Drive

To unload a tape cartridge from a drive, perform the following steps.



Shortcut: Main Menu (initial screen) → Command → Drives → Unload

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 4-96).

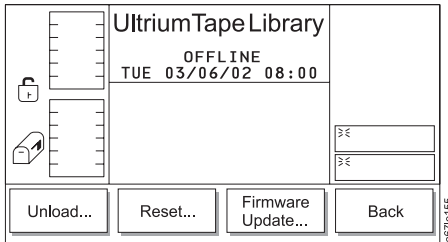


Figure 4-96. Drives Submenu

3. Press the button below the **Unload** softkey. The Unload Dialog displays (see Figure 4-97).

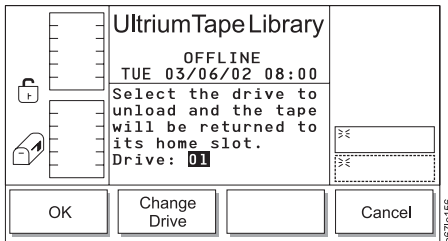


Figure 4-97. Unload Dialog

4. Perform one of the following:
 - To unload the cartridge from the currently displayed drive, press the button below the **OK** softkey.
 - To unload the cartridge from another drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays (drive numbers range from 01 to 06). Then, press the button below the **OK** softkey.

The drive unloads the cartridge, the picker places it in its original slot, and the library displays the message **Requested command is now complete.**

5. To return to the Drives Submenu (see Figure 4-96), press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Resetting a Tape Drive

You can select the type of reset to perform on a tape drive. A soft reset causes the library to issue a reboot command and reinitialize the drive without turning off its power. A hard reset causes the library to cycle power to the drive (turn it off, then on). To reset a drive, perform the following steps.



Shortcut: Main Menu (initial screen) → Command → Drives → Reset

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.
2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 4-98).

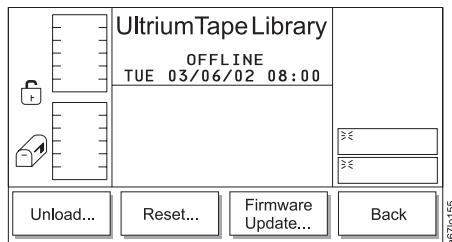


Figure 4-98. Drives Submenu

3. Press the button below the **Reset** softkey. The Reset Dialog displays with the message **Make sure the drive selected is OFFLINE!** (see Figure 4-99). Ensure that the drive has completed all operations and that no backup applications are running.

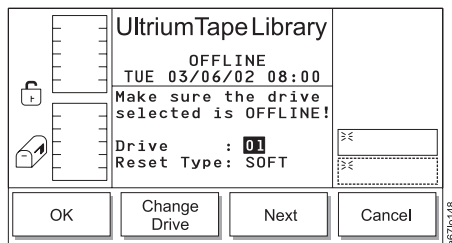


Figure 4-99. Reset Dialog

4. Perform one of the following:
 - To reset the currently displayed drive, press the button below the **Next** softkey.
 - To reset a drive other than the one that is currently displayed, press the button below the **Change Drive** softkey until the number of the drive that you want displays in the Drive field (drive numbers range from 01 to 06). Then, press the button below the **Next** softkey.

The Reset Type Dialog displays (see Figure 4-100) and the selection cursor moves to the Reset Type field.

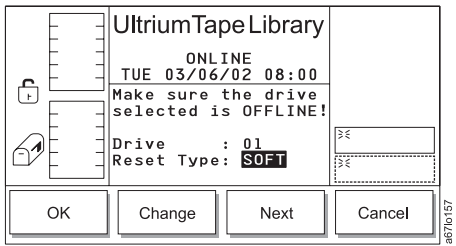


Figure 4-100. Reset Type Dialog

5. To change the type of reset (hard or soft), press the button below the **Change** softkey. A soft reset causes the library to issue a drive reset command; a hard reset causes the library to remove power from the drive.
6. To reset the selected drive, press the button below the **OK** softkey. The library resets the drive and displays the message **Requested command is now complete.**
7. To return to the Reset Dialog (see Figure 4-99 on page 4-59), press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** → **Cancel** → **Back** softkeys. Continue to press the button below the **Back** softkey until the Main Menu displays.

Setting up Remote Communication with the Library

From the RMU

The configuration page (see Figure 4-101) is protected by a password and allows you to configure the remote management unit's network settings (including SNMP). You perform the initial RMU network configuration through the library's operator panel during library installation and setup (see "Step 18. Configure the RMU" on page 14-55).

Remote Management Unit - Microsoft Internet Explorer
Address: http://192.1.1.101

Ultrium Tape Library Specialist

Name: RASRMU (IBM ULT3583-TL)

Logout Status **Configuration** Firmware Diagnostics file Operator panel Logs

Network Configuration	
Hostname	RASRMU
IP Address	192.1.1.101
Subnet Mask	255.255.255.0
Gateway	192.1.1.0

SNMP Configuration	
SNMP Enabled	OFF
Alerts Enabled	OFF
Manager (s)	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)	01/24/05
Time (hh:mm)	13:32
Synchronization with NTP Server	OFF
NTP Server IP Address	0.0.0.0
TimeZone	-07:00 list of timezones

Reboot

[Click here to reboot the RMU](#)

[Click here to reboot the Library](#)

Submit Reset

Figure 4-101. Configuration page

From the Operator Panel

To set up remote communication to the Ultrium Scalable Tape Library, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Library
→ RMU

1. Navigate to the Setup Menu. For instructions, see "Accessing the Setup Menu" on page 4-8.

- Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-102).

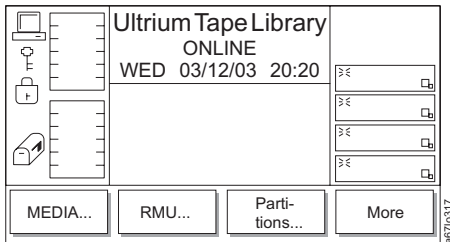


Figure 4-102. Library Submenu

- Press the button below the **RMU** softkey. The Confirm Changes Dialog displays (see Figure 4-103) with the following information:

- IP** The Internet protocol (IP) address of the library. The IP address is an identifier that is unique to the library and is necessary for communication with the server. Valid values are 000.000.000.000 through 255.255.255.255.
- Sub** The subnet mask address of the library. The subnet mask address identifies the library's local area network (LAN). Valid values are 000.000.000.000 through 255.255.255.255.
- Gate** The gateway address, which is the location at which networks attach to each other. Valid values are 000.000.000.000 through 255.255.255.255.
- Name** The hostname that you assign to the RMU for communication with the library through the RMU. Valid values are A through Z and 0 through 9.

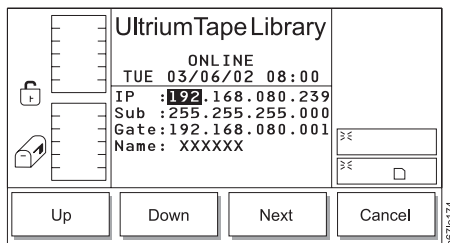


Figure 4-103. Confirm Changes Dialog

- To change the value in one or more fields, cycle through each field by pressing the button below the **Next** softkey until the selection cursor highlights the value in the address that you want to change (an address is divided into four sets of characters that are separated by periods; each set is called an octet). Perform the following:
 - To change the library's IP address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the IP field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
 - To change the library's subnet mask address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the Sub field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
 - To change the gateway address, press the button below the **Next** softkey until the selection cursor highlights the octet that you want in the Gate field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.

- To change the host name that is assigned to the RMU, press the button below the **Next** softkey until the selection cursor highlights the first character in the Name field. Press the button below the **Up** or **Down** softkeys to increase or decrease the alphabetical or numeric value. Repeat for each character in the new host name.
5. Verify that the new settings are correct on the display, then press the button below the **Next** softkey until the Confirm Changes Dialog displays (see Figure 4-104).

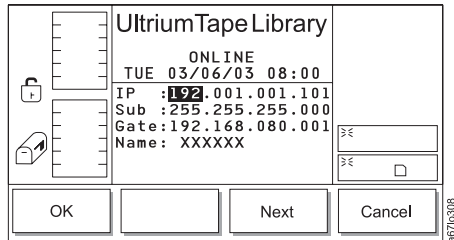


Figure 4-104. Confirm Changes Dialog

6. To accept the changes and establish the settings for remote communication between library and the network, press the button below the **OK** softkey. The Library Submenu redisplay (see Figure 4-102 on page 4-62). To return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Viewing or Changing a Drive's SCSI ID and Control Path Status

To view or change a drive's SCSI ID and control path status, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Drives → SCSI...

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 4-105).

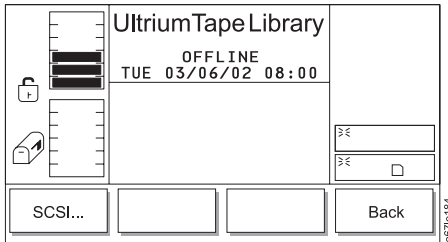


Figure 4-105. Drives Submenu

3. Press the button below the **SCSI** softkey. The Drive SCSI Dialog displays (see Figure 4-106). The screen may vary, depending on whether your library has the Multi-Path feature.

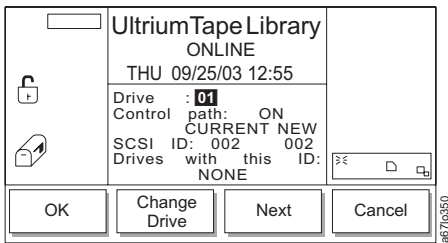


Figure 4-106. Drive SCSI Dialog for Drives

The Ultrium Scalable Tape Library consists of up to seven SCSI devices: the library and six drives. The default settings for the SCSI IDs are 1 through 6 for the drives.

Notes:

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

To determine whether a SCSI ID is already in use, see your system administrator.

The Drive SCSI Dialog contains the current and new (if you decide to change them) SCSI settings for the drives. Settings are presented individually for each drive. The Drive SCSI Dialog includes the following information:

Drive	The number of the drive. The number is based on the location of the drive in the drive column. The numbers range from 01 to 06, from bottom to top.
SCSI ID	The current and new SCSI ID of the selected drive. Valid values are 00 through 15.

Control path	A logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library.
Drives with this ID	The drive that has the same SCSI ID as the selected drive. This field is for information only.

4. Perform one or more of the following:
 - To accept the current settings, press the button below the **Cancel** softkey. The Drives Submenu redisplay (see Figure 4-105 on page 4-64).
 - To change the value in one or more fields, perform the following:
 - To change the number of the drive, press the button below the **Change Drive** softkey until the value that you want displays.
 - To change the SCSI ID of the drive, press the button below the **Next** softkey until the selection cursor highlights the value in the New column of the SCSI ID field. Press the button below the **Up** or **Down** softkeys until the SCSI ID that you want displays. Verify that the new settings are correct on the display and that no other drives have the SCSI ID that you specified (ensure that the field *Drives with this ID: NONE* displays). Press the button below the **Next** softkey, then **OK** softkey to accept the new settings. The library resets the drives with their new IDs and displays the message **Requested command is now complete**. Press the button below the **OK** softkey to return to the Drives Submenu (see Figure 4-105 on page 4-64). Wait approximately one minute for the drive to accept the changes.
5. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Viewing or Changing an FC ID

Attention:

- The Ultrium Scalable Tape Library assigns a default FC ID to each Ultrium Tape Drive that uses a Fibre Channel interface. To view or change a drive's Fibre Channel FC ID, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Drives → SCSI...

- The FC submenu displays (see Figure 4-107). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the Drive: field. The value of its FC ID displays in the FC ID: CURRENT field.

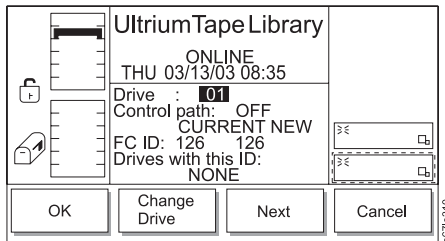


Figure 4-107. FC Submenu

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

- To change the Control Path or FC ID setting for the drive, perform the following steps:
 - Press the button below the **Next** softkey. The FC ID Dialog displays (see Figure 4-108).

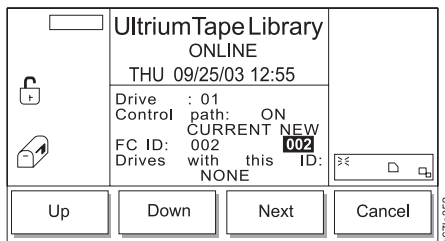


Figure 4-108. FC ID Dialog

- Press the button below the **Up** or **Down** softkey until the value that you want displays in the Control path: or FC ID: NEW field.
- Press the button below the **Next** softkey to display the second page of the FC ID Dialog (see Figure 4-109 on page 4-67).

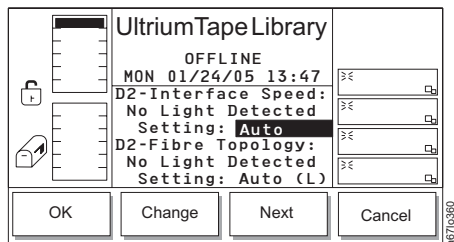


Figure 4-109. Second page of the FC ID Dialog

4. Press the button below the **Change** softkey as many times as necessary until the desired value is displayed in the D2-Interface Speed: No Light Detected Setting: field.
5. Press the button below the **Next** softkey to move to the next item.
6. Press the button below the **Change** softkey as many times as necessary until the desired value is displayed in the D2-Fibre Topology: No Light Detected Setting: field.
7. Press the button below the **OK** softkey to accept the changes.
8. To activate the new FC ID, cycle power to the library (turn it off, then on again).

Changing the Date and Time

From the RMU

The configuration page (see Figure 4-110) is protected by a password and allows you to set the date and time for the RMU.

Remote Management Unit - Microsoft Internet Explorer
Address: http://192.1.1.101

Ultrium Tape Library Specialist

Name: RASRMU (IBM ULT3583-TL)

Logout Status **Configuration** Firmware Diagnostics file Operator panel Logs

Network Configuration	
Hostname	RASRMU
IP Address	192.1.1.101
Subnet Mask	255.255.255.0
Gateway	192.1.1.0

SNMP Configuration	
SNMP Enabled	OFF
Alerts Enabled	OFF
Manager (s)	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)	01/24/05
Time (hh:mm)	13:32
Synchronization with NTP Server	OFF
NTP Server IP Address	0.0.0.0
TimeZone	-07:00 list of timezones

Reboot
[Click here to reboot the RMU](#)
[Click here to reboot the Library](#)

Submit Reset

a67to179

Figure 4-110. Configuration page

From the Operator Panel

To set the date and time in the library, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Date/Time

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.

2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-111).

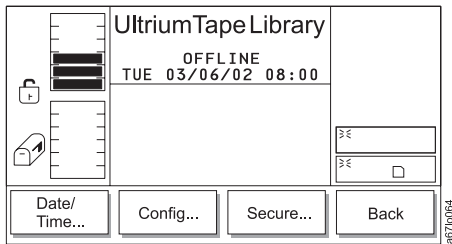


Figure 4-111. Utils Submenu

3. Press the button below the **Date/Time** softkey. The Date/Time Dialog displays (see Figure 4-112) with the following information:

- Year** The year of the century. Valid values are 00 through 99.
- Month** The month of the year. Valid values are 0 through 12.
- Day** The day of the month. Valid values are 00 through 31.
- Hour** The hour of the day. Valid values are 0 through 23.
- Min** The minute of the hour. Valid values are 0 through 59.
- Sec** The second of the minute. Valid values are 0 through 59.

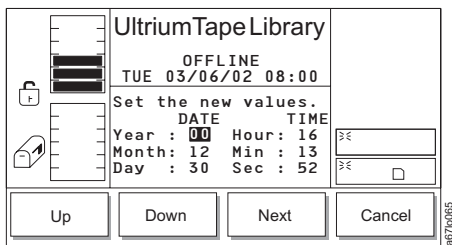


Figure 4-112. Date/Time Dialog

4. Perform one or more of the following:

- To change the value in the Year, Month, Day, Hour, Min, or Sec fields, press the button below the **Next** softkey until the selection cursor highlights that value. Press the button below the **Up** or **Down** softkeys until the value that you want displays. Press the **Next** softkey until the **OK** softkey displays.
- To synchronize the date and time between the server and the library, press the button below the **Next** softkey until the selection cursor highlights the value in the Sync interface field. Press the button below the **Yes/No** softkey until Yes (enable synchronization) or No (disable synchronization) displays.

5. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to accept the new date and time. The Utils Submenu redisplay (see Figure 4-111 on page 4-69).
6. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.

Enabling and Disabling Backlighting and Audio

To enable or disable the operator panel's backlighting and the audio, perform the following steps.

Note: If you change the setting for backlighting and audio, you must cycle power to the library (turn it off, then on) to make the change take effect.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → **Config**

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-113).

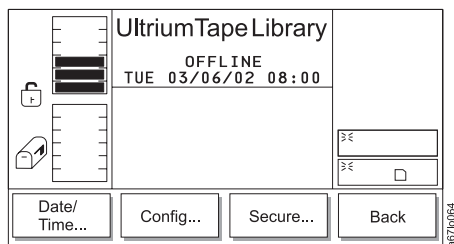


Figure 4-113. Utils Submenu

3. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 4-114) with the following information:

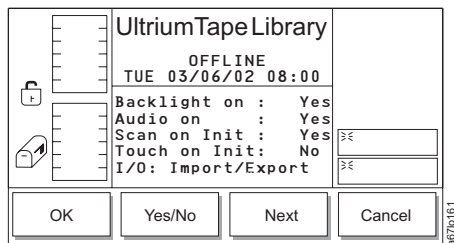


Figure 4-114. Config Dialog

4. Perform one or more of the following:
 - To turn the backlighting of the operator panel on or off, press the button below the **Next** softkey until the selection cursor highlights the value in the Backlight on field. Press the button below the **Yes/No** softkey until Yes (enable backlighting) or No (disable backlighting) displays.
 - To turn the audio on or off, press the button below the **Next** softkey until the selection cursor highlights the value in the Audio on field. Press the button below the **Yes/No** softkey until Yes (enable audio) or No (disable audio) displays.
5. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to accept the new backlighting and audio settings. The Utils Submenu redisplay (see Figure 4-113).
6. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.
7. To activate the changes, cycle power to the library (turn it off, then on).

Choosing the Method of Inventory

The library offers two ways to perform an inventory whenever you power it on (initialization). You can configure the library so that it scans the bar codes on each labeled cartridge or touches each unlabeled cartridge with the fingers of the picker. Each method provides an inventory of the library's cartridges. The scanning method is the default and takes less time than the touching method.

To choose the method of inventory during initialization, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → **Config**

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-115).

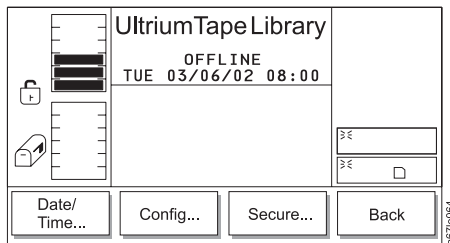


Figure 4-115. Utils Submenu

3. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 4-116) with the following information:

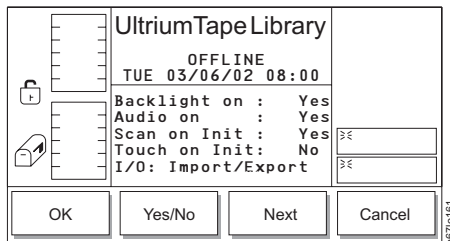


Figure 4-116. Config Dialog

4. Perform one of the following:
 - To cause the library to perform an inventory by scanning the bar codes on labeled cartridges, press the button below the **Next** softkey until the selection cursor highlights the value in the Scan on Init field. Press the button below the **Yes/No** softkey until Yes displays (enable scanning).
 - To cause the library to perform an inventory by touching the cartridges, press the button below the **Next** softkey until the selection cursor highlights the value in the Touch on Init field. Press the button below the **Yes/No** softkey until Yes displays (enable touching).
5. Verify that the new setting is correct on the display, then press the button below the **OK** softkey to accept the new inventory setting. The Utils Submenu redisplay (see Figure 4-115).
6. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.
7. To activate the new setting, cycle power to the library (turn it off, then on).

Configuring the I/O Station as Storage Slots

To configure the I/O station as storage slots, perform the following steps.

Note: If you configure the I/O station as storage slots, you must cycle power to the library (turn it off, then on) to make the change take effect.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Config

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-117).

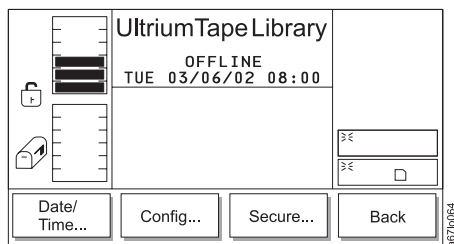


Figure 4-117. Utils Submenu

3. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 4-118) with the following information:

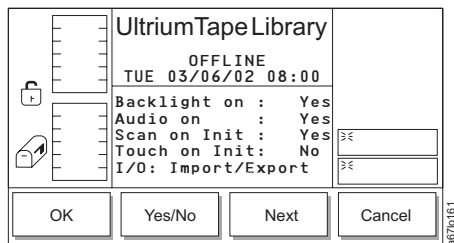


Figure 4-118. Config Dialog

4. Press the button below the **Next** softkey until the selection cursor highlights the value in the I/O Station field. The screen automatically refreshes and the I/O Station field changes to I/O: Import/Export.
5. Perform one of the following:
 - To configure the I/O station as an import and export location, press the button below the **Change** softkey until Imprt/Expprt displays.
 - To configure the I/O station as cartridge storage slots, press the button below the **Change** softkey until Storage displays.
6. Verify that the new setting is correct on the display, then press the button below the **OK** softkey to accept the setting. The library displays a message that it must reboot to make the changes. Press the button below the **OK** softkey. The Utils Submenu redisplay (see Figure 14-48 on page 14-47).
7. To return to the Main Menu press the button below the **Back** softkey until the Main Menu displays.
8. To activate the new setting, cycle power to the library (turn it off, then on).

Enabling Security

The Enable Security feature allows you to protect your data. The default setting is Disable Security, but you can enable security by using the following procedure.

Note: When security is enabled, the library will prompt you for your password each time that you attempt to access certain protected procedures.

To enable security on the library, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Secure

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-119).

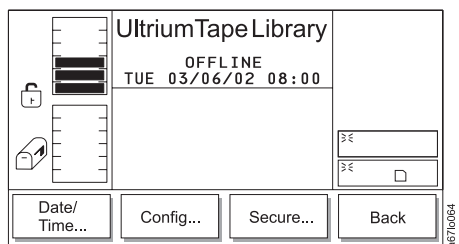


Figure 4-119. Utils Submenu

3. Press the button below the **Secure** softkey. The Secure Dialog displays (see Figure 4-120).

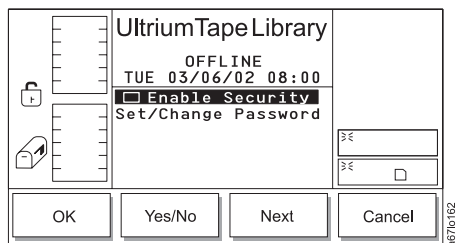


Figure 4-120. Secure Dialog

4. Press the button below the **Yes/No** softkey until a checkmark displays in the checkbox beside the Enable Security field. The library displays the message **Security is now ON.**
5. Press the button below the **OK** softkey to redisplay the Secure Dialog and view the new setting.
6. To return to the Utils Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Changing Your Passwords

You change your RMU password from the RMU and your operator panel security password from the operator panel.

RMU Password

To change your RMU password from the RMU, see “Configuration” on page 3-11. When changing your password, record it on the Library Configuration Form and place the form in a secure location.

Operator Panel Password



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Secure

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-121).

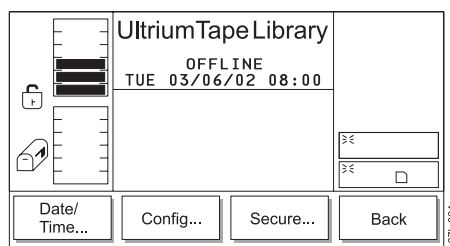


Figure 4-121. Utils Submenu

3. Press the button below the **Secure** softkey. The Enter Password Dialog displays (see Figure 4-122).

Note: If security is enabled, you must enter the existing or default password to display the Secure Dialog (see Figure 14-55 on page 14-51). The initial default password is **0000**.

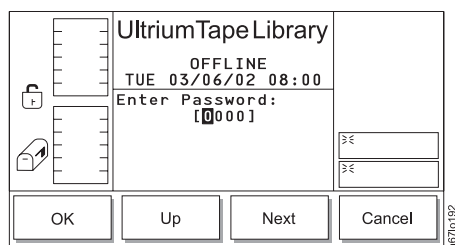


Figure 4-122. Enter Password Dialog

4. Enter your existing password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the New field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value.
5. Press the button below the **OK** softkey. The Secure Dialog screen displays (see Figure 4-123 on page 4-76).

Note: In Figure 14-55 on page 14-51, the absence of a checkmark in the checkbox beside the Enable Security field indicates that security has not been enabled.

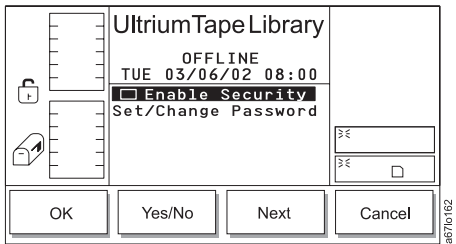


Figure 4-123. Secure Dialog

6. Press the button below the **Next** softkey to highlight the Set/Change Password field.
7. Press the button below the **Change** softkey. The Set/Change Password Dialog displays (see Figure 4-124).

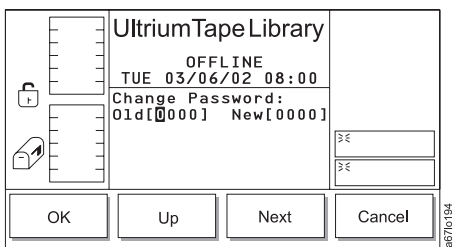


Figure 4-124. Set/Change Password Dialog

8. Enter the old password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the Old field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the old password, then press the button below the **OK** softkey to go to the New field.
9. Enter the new password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the New field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the new password.
10. Verify that the passwords are correct on the display, then press the button below the **OK** softkey to effect the change. The library displays the message **The password has been changed.**
11. Record your new password on the Library Configuration Form and store the form in a secure location.
12. To return to the Secure Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey.
13. To continue to return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Disabling Security

To disable security on the library, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Secure

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 4-125).

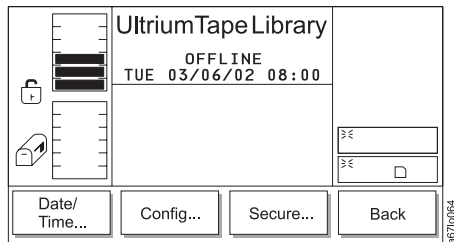


Figure 4-125. Utils Submenu

3. Press the button below the **Secure** softkey. The Enter Password Dialog displays (see Figure 4-126).

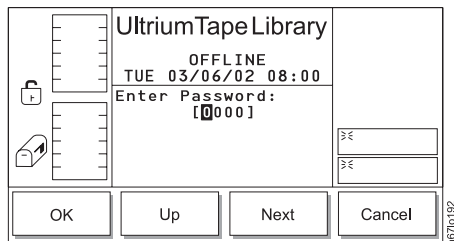


Figure 4-126. Enter Password Dialog

4. Enter your password by pressing the button below the **Next** softkey until the selection cursor highlights the character that you want to change. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat as necessary for each character in the password.
5. Verify that the password is correct on the display, then press the button below the **OK** softkey. The Security Enabled Dialog displays with a checkmark beside the Enable Security field to indicate that security is currently enabled (see Figure 4-127).

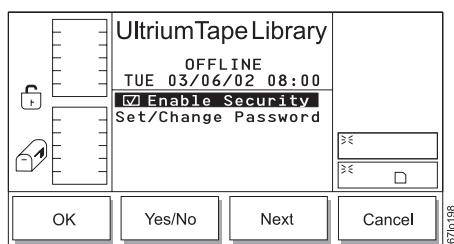


Figure 4-127. Security Enabled Dialog

- Press the button below the **Yes/No** softkey until the checkmark disappears from the checkbox beside the Enable Security field. The Enter Password Dialog displays (see Figure 4-128).

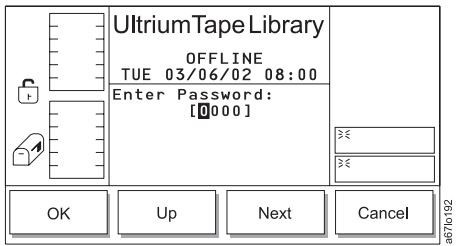


Figure 4-128. Enter Password Dialog

- Enter your password by pressing the button below the **Next** softkey until the selection cursor highlights the character that you want to change. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat as necessary for each character in the password.
- Verify that the password is correct on the display, then press the button below the **OK** softkey. The library displays the message **Security is now OFF**.
- Press the button below the **OK** softkey to redisplay the Secure Dialog and view the new setting (see Figure 4-129).

Recommendation: Security is now OFF and eliminates the need for a password. If the password has

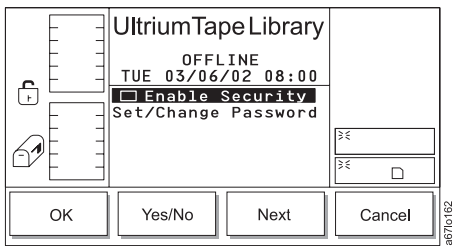


Figure 4-129. Secure Dialog

been changed to something other than the default password [0000], it is recommended to change it back to the default password. Otherwise, if security is enabled sometime in the future, the current password will still be in effect and will have to be remembered in order to navigate through the screens or even to disable security.

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

Entering the Control Path Failover License Key

The Ultrium Scalable Tape Library requires that you use an 8-character license key to enable the control path failover feature. To enter a license key, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → More → License

The License Dialog displays (see Figure 4-130).

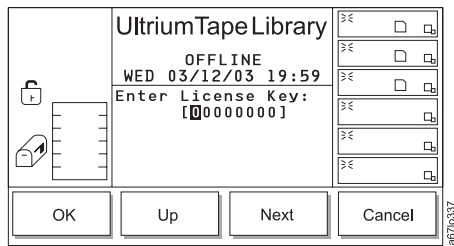


Figure 4-130. License Dialog

- Perform one of the following:
 - To accept all characters in the license key, press the button below the **OK** softkey.
 - To select another character, press the button below the **Next** softkey until the character that you want is highlighted. To increment that character, press the button below the **Up** softkey until 0 through 9 or A through F displays.
- To return to the Main Menu press the button below the **OK** softkey, then press the button below the **OK** and **Back** softkeys until the Main Menu displays.

Resolving Errors

If a problem occurs during operation, you can view service action codes (SACs) from which you can determine the source of the error and the action required to correct it. To view the SACs, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Service → Start

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Start** softkey. The Start Dialog displays (see Figure 4-131) with the NORMAL service type highlighted.

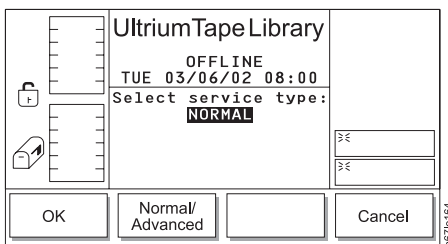


Figure 4-131. Start Dialog

3. Perform one of the following:
 - To view the SAC codes and resolve the error by yourself (normal service), press the button below the **OK** softkey. The Normal Service Dialog displays a list of SACs and a message when there are no more SACs to report (see Figure 4-132). To return to the Service Menu, press the button below the **OK** softkey.

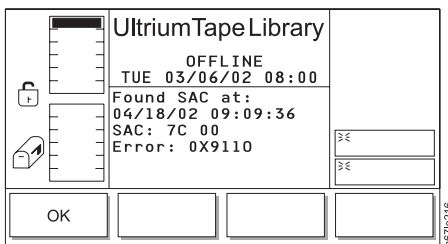


Figure 4-132. Normal Service Dialog

- **Instruction for service personnel only:** To reenter the library’s serial number after you have replaced the main controller board, press the button below the **Normal/Advanced** softkey. The screen refreshes and highlights the **ADVANCED** service type. The Enter Password Dialog displays (see Figure 4-133 on page 4-81).

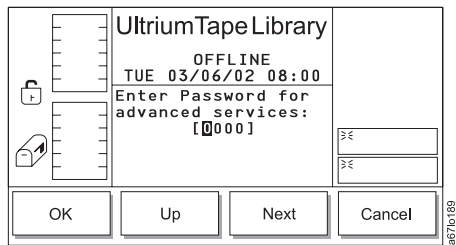


Figure 4-133. Enter Password Dialog

Enter the 4-character password (if you do not know the password, contact your Support Center). To enter the password, perform the following steps:

- a. Press the button below the **Up** or **Down** softkey to increase or decrease the value in the highlighted field, then press the button below the **Next** softkey to accept the value and move to the next character in the password.
- b. Repeat step 3a for each character in the password until the complete password displays.
- c. Verify that the password is correct on the display, then press the button below the **OK** softkey to access the screen in which you can reenter the library's serial number.
- d. Repeat step 3a to enter each character of the serial number until the complete serial number displays. The preferred method of entering the library serial number on a new main controller board utilizes the library serial port using the command `setser` (see the section about the main controller board in the *Ultrium Scalable Tape Library Maintenance Information* guide). Libraries with the Multi-Path feature use internal 3583 library arbitration firmware to set the serial number and eliminate the need for manual entry of the serial number that is required in machines without the Multi-Path feature.

Running Library Diagnostics

The library includes diagnostics for the sensors, the vertical and rotary axes of the picker, and the fingers on the picker. The sections that follow describe each type of diagnostic.

Checking the Sensors and Locking or Unlocking of the I/O Station Door

To view the status of library mechanisms through their sensors and to lock or unlock the I/O station door, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Service → Library → Diags → Sensors

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-134).

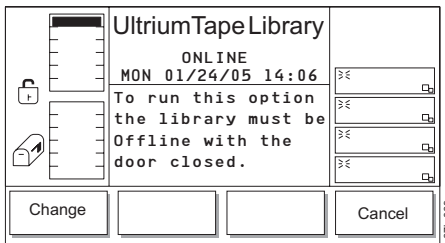


Figure 4-134. Library Submenu

3. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-135).

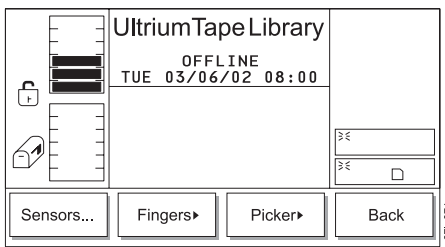


Figure 4-135. Diags Submenu

4. Press the button below the **Sensors** softkey. The Sensor Dialog displays (see Figure 4-136).

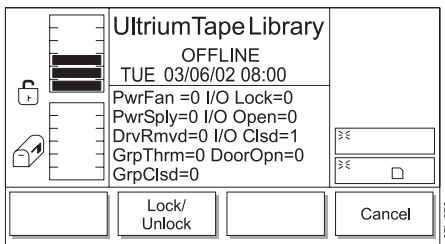


Figure 4-136. Sensor Dialog

The Sensor Dialog contains the following information. You can change only the I/O Lock field; all other fields are for information only and cannot be changed.

PwrFan Status of the power supply fan. 0 means not operating; 1 means operating.

PwrSply Installation of additional power supply. 0 means not installed; 1 means installed.

Drv Rmvd Status of the tape drive. 0 means that the drive has not been removed; 1 means that the drive has been removed.

GrpThrm Installation of picker's thermometer. 0 means not installed; 1 means installed.

GrpClsd Status of the picker. 0 means open; 1 means closed.

I/O Lock Status of the lock on the I/O station door. 0 means unlocked; 1 means locked. You can also determine the status by examining the padlock icon in the I/O station status area. If the door of the I/O station is locked, the arm of the icon is down; if the door of the I/O station is unlocked, the arm of the icon is up.

I/O Open Status of the I/O station door. 0 means closed; 1 means open.

I/O Clsd Status of the I/O station door. 0 means open; 1 means closed.

DoorOpn Status of the front door. 0 means closed; 1 means open.

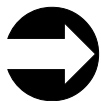
5. To lock or unlock the I/O station door, press the button below the **Lock/Unlock** softkey until 0 (unlocked) or 1 (locked) displays in the I/O Lock field.

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

Checking the Picker's Get and Put Capability

To check the ability of the picker to get and put tape cartridges into storage slots or drives, perform the following steps.

Note: Get/Put diagnostic does not return the cartridges to their original location.



Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Diags —> Fingers —> Get/Put

1. Navigate to the Service Menu. For instructions, see "Accessing the Service Menu" on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-137).

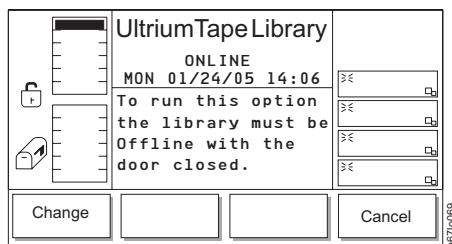


Figure 4-137. Library Submenu

3. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-138 on page 4-84).

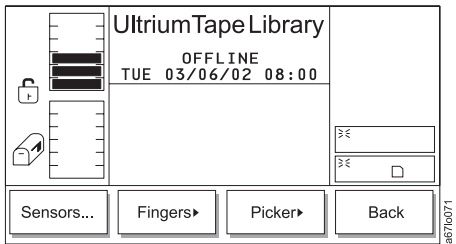


Figure 4-138. Diags Submenu

4. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 4-139).

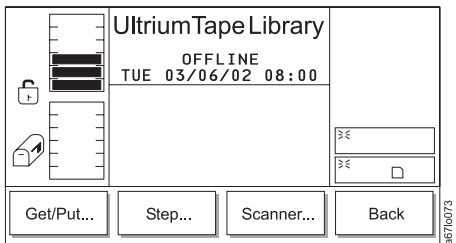


Figure 4-139. Fingers Submenu

5. Press the button below the **Get/Put** softkey. The Get/Put Dialog displays (see Figure 4-140).

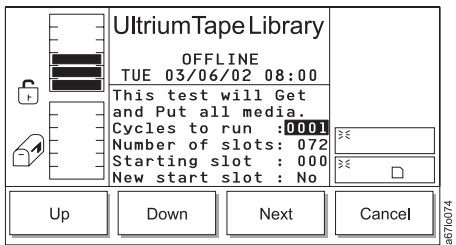


Figure 4-140. Get/Put Dialog

The Get/Put Dialog contains the following information:

Cycles to run	Specifies the number of cycles to run. Valid values are 1 through 9999.
Number of slots	Specifies the number of slots to use during the cycles. Valid values are 1 through 72.
Starting slot	Indicates the slot location from which the Get/Put diagnostic will begin. This a read-only field that you can only change after you specify Yes in the New start slot field (see the description of the next field).
New start slot	Specifies the new slot location from which the Get/Put diagnostic will begin. Valid values are Yes (change the start slot) or No (use this installed).

6. Perform one or more of the following:
- To change the value in the Cycles to run field, press the button below the **Up** or **Down** softkeys until the value that you want displays.
 - To change the value in the Number of slots field, press the button below the **Next** softkey until the selection cursor highlights that field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.

- To change the value in the Starting slot field, perform the following steps:
 - a. Press the button below the **Next** softkey until the selection cursor highlights the New start slot field. The New Start Slot Dialog displays (see Figure 4-141).

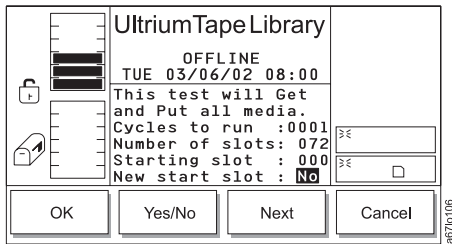


Figure 4-141. New Start Slot Dialog

- b. Press the button below the **Yes/No** softkey until Yes displays.
- c. Press the button below the **OK** softkey. The Get/Put Source Dialog displays (see Figure 4-142) with a message area that shows three icons:

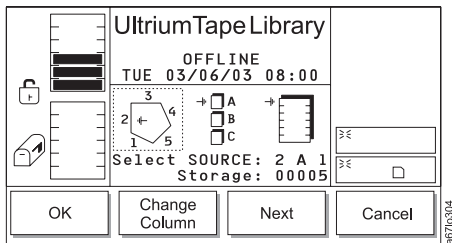


Figure 4-142. Get/Put Source Dialog

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

The position of the arrow in each of the three icons identifies the storage slot's physical address. For example, arrows that point to a column 2, magazine A, and storage slot 1 indicate a physical address of 2 A 1. In the Get/Put Source Dialog, a slot's physical address displays below the right icon (see Figure 4-142).

- Specify the new location from which you want the Get/Put diagnostic to start by performing one of the following:
 - To specify the physical address that is currently displayed, press the button below the **OK** softkey.
 - To specify another location, perform the following steps:
 - a. Press the button below the **Change Column** softkey until the arrow in the left icon points to the column that you want. Press the button below the **Next** softkey. The Change Magazine Dialog displays (see Figure 4-143 on page 4-86).

Note: If you choose the drive column (column 3), the Change Drive Dialog displays because no slots or magazines are available in this column. To choose a different column, press the button below the **Next** softkey, then press the button below the **Change**

Column softkey until the arrow points to the column that you want. Press the button below the **Next** softkey to display the Change Magazine Dialog.

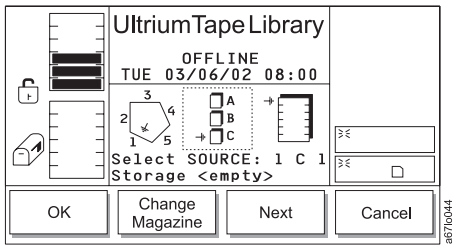


Figure 4-143. Change Magazine Dialog

- b. Press the button below the **Change Magazine** softkey until the arrow in the middle icon points to the magazine that you want. Press the **Next** softkey. The Change Slot Dialog displays (see Figure 4-144).

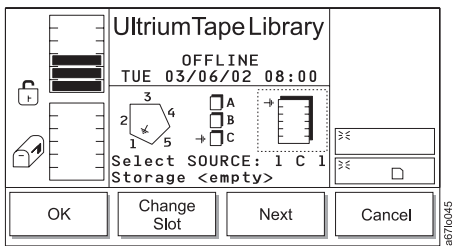


Figure 4-144. Change Slot Dialog

- c. Press the button below the **Change Slot** softkey until the arrow in the right icon points to the storage slot that you want.
- d. Perform one of the following:
 - To accept the physical address of the storage slot (located below the right icon), press the button below the **OK** softkey.
 - To cycle through the Change Column, Change Magazine, and Change Slot choices again, press the **Next** softkey. Make your selections, then press the button below the **OK** softkey.
7. Press the button below the **OK** softkey, or the one below the **Cancel** softkey. The Get/Put Execution screen displays with a Status field that indicates the diagnostic is Running (see Figure 4-145). When the test completes, the screen refreshes and the Status field displays Completed. To stop the diagnostic, press the **Cancel** softkey while the diagnostic is running.

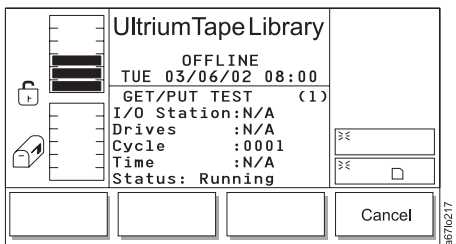


Figure 4-145. Get/Put Execution screen

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

Checking the Picker's Open, Close, Reach, and Retract Capabilities

To check the ability of the picker to open, close, reach, and retract its fingers, perform the following steps.

Note: This is an advanced diagnostic that is not intended for use during normal operation.



Shortcut: Main Menu (initial screen) → More → Service → Library
→ Diags → Fingers → Step

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-146).

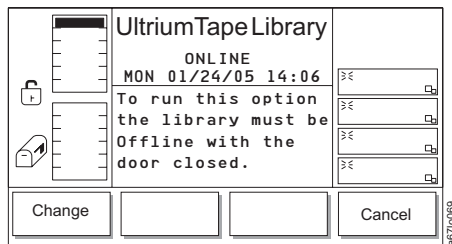


Figure 4-146. Library Submenu

3. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-147).

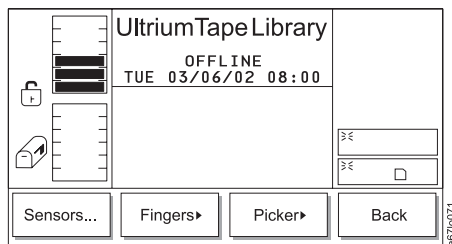


Figure 4-147. Diags Submenu

4. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 4-148).

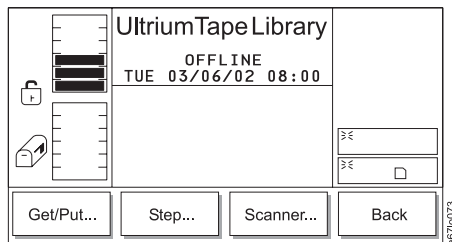


Figure 4-148. Fingers Submenu

5. Press the button below the **Step** softkey. The Step Dialog displays a reminder that this diagnostic should be used by trained personnel only (see Figure 4-149 on page 4-88).

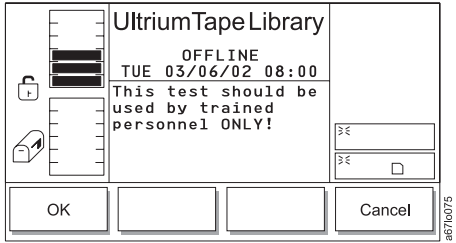


Figure 4-149. Step Dialog

6. Press the button below the **OK** softkey. The Picker Finger Dialog displays (see Figure 4-150).

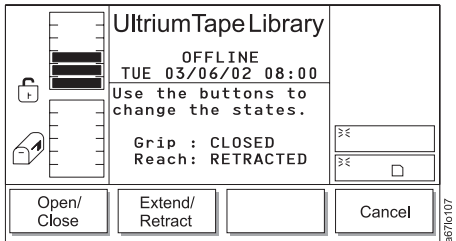


Figure 4-150. Picker Finger Dialog

The Picker Finger Dialog contains the following information:

Grip Indicates whether the picker's fingers are open or closed. Valid values are OPEN or CLOSED.

Reach Indicates whether the picker's fingers are extended or retracted. Valid values are EXTENDED or RETRACTED.

7. Perform one or more of the following:
 - To open or close the picker's fingers, press the button below the **Open/Close** softkey until the value that you want displays in the Grip field.
 - To extend or retract the picker's fingers, press the button below the **Extend/Retract** softkey until the value that you want displays in the Reach field.
8. To return to the Fingers Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Functionality of the Bar Code Reader

To check the ability of the bar code reader to read the bar code labels on the tape cartridges, perform the following steps.

Note: Before beginning this procedure, choose an occupied slot as a point of reference and position the picker in front of that slot (see "Moving the Picker" on page 4-41). Make a note of the cartridge's VOLSER.



Shortcut: Main Menu (initial screen) → More → Service → Library
→ Diags → Fingers → Scanner

1. Navigate to the Service Menu. For instructions, see "Accessing the Service Menu" on page 4-9.

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-151).

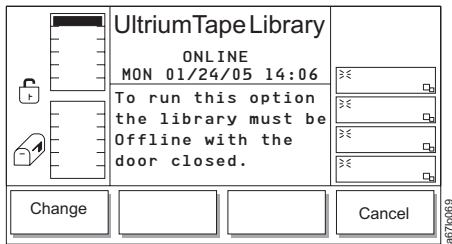


Figure 4-151. Library Submenu

3. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-152).

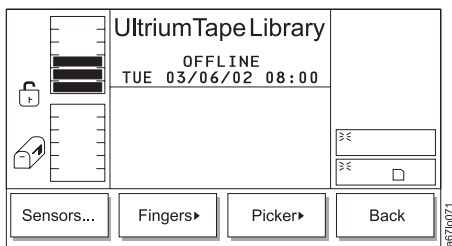


Figure 4-152. Diags Submenu

4. Press the button below the **Fingers** softkey. The Fingers Submenu displays (see Figure 4-153).

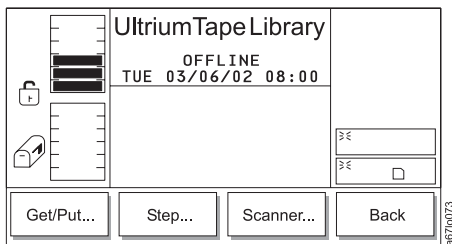


Figure 4-153. Fingers Submenu

5. Press the button below the **Scanner** softkey. The Reader Dialog displays (see Figure 4-154).

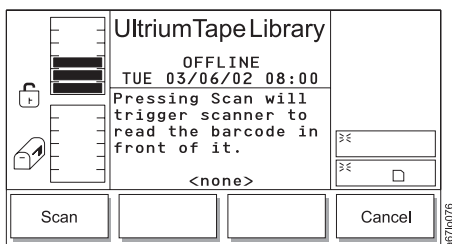


Figure 4-154. Reader Dialog

6. Press the button below the **Scan** softkey. The bar code reader scans the cartridge that is currently in front of it. The Bar Code Label Dialog displays the cartridge's VOLSER (see Figure 4-155 on page 4-90). Ensure that the VOLSER on the operator panel matches the VOLSER on the cartridge.

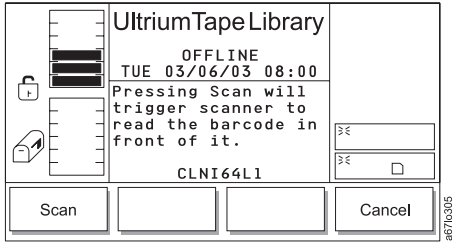


Figure 4-155. Bar Code Label Dialog

- To return to the Fingers Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Movement of the Picker

The Picker diagnostic checks the ability of the picker to move its vertical and rotary axes in motion patterns and in incremental steps. It also tests the picker’s ability to locate to the home position. The sections that follow describe each procedure.

Checking the Picker’s Motion Patterns

To check the ability of the picker to move the vertical and rotary axes in motion patterns, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Service → Library → Diags → Picker → Move

- Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
- Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-156).

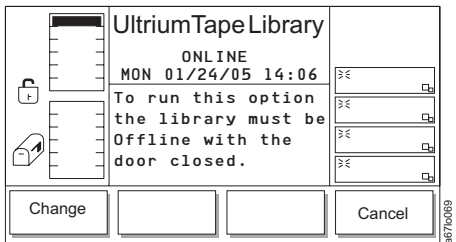


Figure 4-156. Library Submenu

- Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-157).

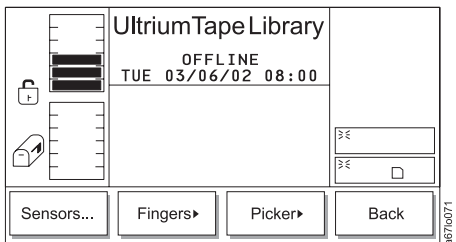


Figure 4-157. Diags Submenu

4. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 4-158).

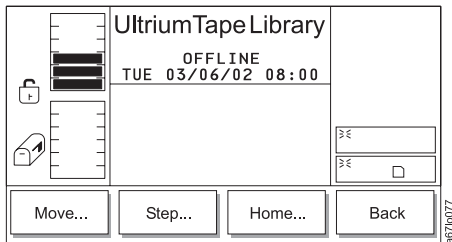


Figure 4-158. Picker Submenu

5. Press the button below the **Move** softkey. The Move Dialog displays (see Figure 4-159).

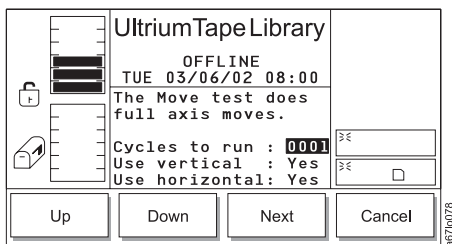


Figure 4-159. Move Dialog

The Move Dialog contains the following information:

- | | |
|-----------------------|---|
| Cycles to run | Specifies the number of move cycles. Valid values are 1 through 9999. |
| Use vertical | Specifies whether to move the picker on the vertical axis. Valid values are Yes (move on the vertical axis) or No (do not move on the vertical axis). |
| Use horizontal | Specifies whether to move the picker on the horizontal axis. Valid values are Yes (move on the horizontal axis) or No (do not move on the horizontal axis). |

6. Perform one or more of the following:

- To change the number of cycles to run, press the button below the **Up** or **Down** softkeys until the value that you want displays in the Cycles to run field.
- To specify whether to test the vertical or horizontal axis, press the button below the **Next** softkey until the selection cursor highlights the value in the Use vertical or Use horizontal field. The Use Axis Dialog displays (see Figure 4-160). Press the button below the **Yes/No** softkey until the value that you want displays.

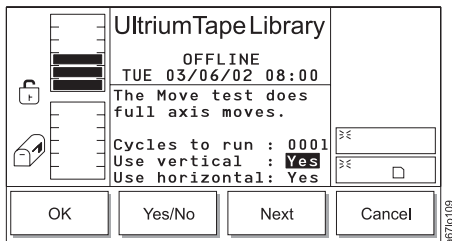


Figure 4-160. Use Axes Dialog

- Press the button below the **OK** softkey to perform the diagnostic. The Move Test Execution screen displays (see Figure 4-145 on page 4-86) with a summary of the test settings and a Status field that indicates that the diagnostic is Running. When the test completes, the screen refreshes and the Status field displays Completed.

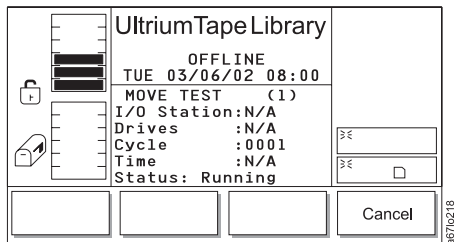


Figure 4-161. Move Test Execution screen

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

Checking the Picker's Step Capability

To check the ability of the picker to move vertically and to rotate in incremental steps, perform the following instructions.

Note: This is an advanced diagnostic tool that is not intended for use during normal operation.



Shortcut: Main Menu (initial screen) → More → Service → Library → Diags → Picker → Step

- Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
- Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-162).

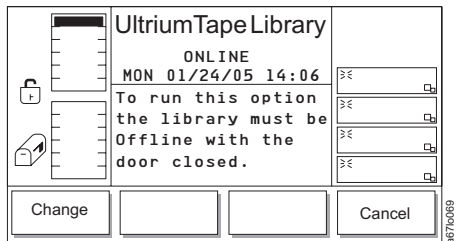


Figure 4-162. Library Submenu

- Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-163 on page 4-93).

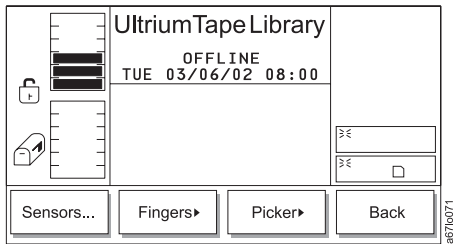


Figure 4-163. Diags Submenu

4. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 4-164).

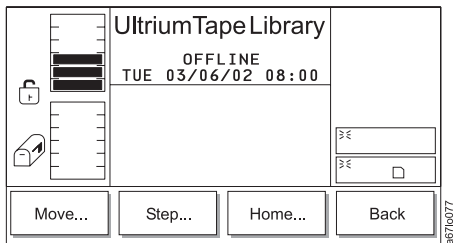


Figure 4-164. Picker Submenu

5. Press the button below the **Step** softkey. The Step Dialog displays a reminder that this diagnostic should be used by trained personnel only (see Figure 4-165).

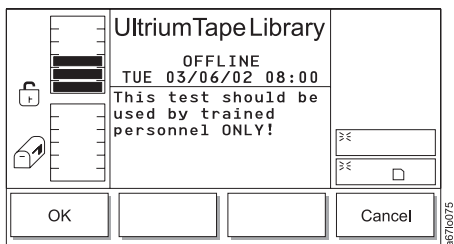


Figure 4-165. Step Dialog

6. Press the button below the **OK** softkey. The Axes Dialog displays (see Figure 4-166).

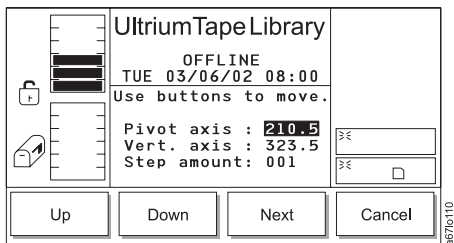


Figure 4-166. Axes Dialog

The Axes Dialog contains the following information:

- Pivot axis** Indicates the degrees of the rotary position. Valid values are 000.0 through 360.0.
- Vert. axis** Indicates the height of the picker in millimeters. Valid values are 000.0 through the maximum range.

Step amount Indicates tenths of millimeters to step. Valid values are 001 through 100.

7. Perform one or more of the following:
 - To change the degrees of the rotary position, press the button below the **Up** or **Down** softkeys until the value that you want displays in the Pivot axis field.
 - To change the height of the picker, press the button below the **Next** softkey until the selection cursor highlights the value in the Vert. axis field. Then, press the button below the **Up** or **Down** softkeys until the value that you want displays.
 - To change the amount of the step, press the button below the **Next** softkey until the selection cursor highlights the value in the Step amount field. Then, press the button below the **Up** or **Down** softkeys until the value that you want displays.
8. To accept the changes and return to the Picker Submenu, press the button below the **Cancel** softkey. To return to the Main Menu press the button below the **Cancel** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Checking the Picker's Homing Capability

To check the ability of the picker to locate the vertical and rotary axes to the home position, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Service → Library → Diags → Picker → Home

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-167).

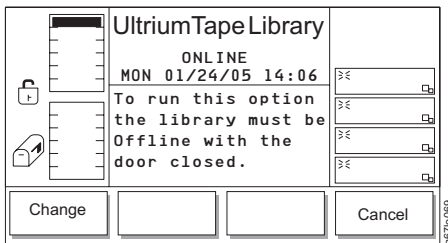


Figure 4-167. Library Submenu

3. Press the button below the **Diags** softkey. The Diags Submenu displays (see Figure 4-168).

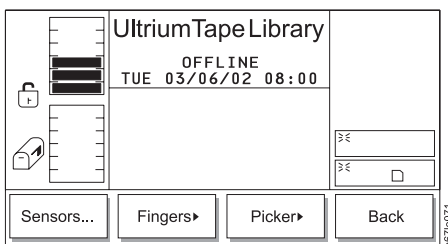


Figure 4-168. Diags Submenu

4. Press the button below the **Picker** softkey. The Picker Submenu displays (see Figure 4-169 on page 4-95).

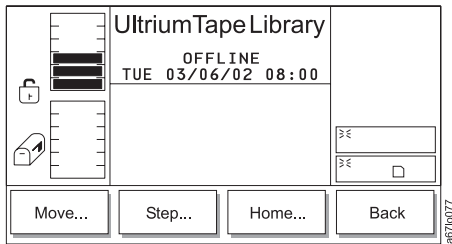


Figure 4-169. Picker Submenu

5. Press the button below the **Home** softkey. The Home Dialog displays (see Figure 4-170) with a message stating that the picker will relocate to its zero position on all axes.

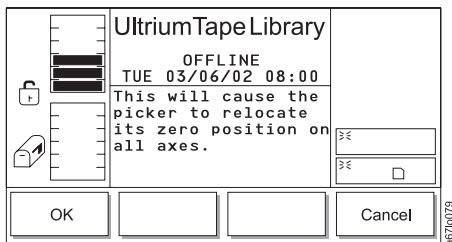


Figure 4-170. Home Dialog

6. Press the button below the **OK** softkey. The picker returns to the home position and the library displays the message **Requested command is now complete.**
7. To return to the Picker Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Exercising the Library

The library's exercises include a demonstration, a self test, and a calibration procedure known as Teach. The sections that follow describe each exercise.

Performing a Demonstration of the Library

The library's demonstration (demo) illustrates random cartridge movement in the library. The minimum number of cartridges recommended for this routine is two per drive, plus one additional cartridge. To perform a demo of the library, use the following steps.

Note: This operation does not return the cartridges to their original location.



**Shortcut: Main Menu (initial screen) → More → Service → Library
→ Exercise → Demo**

1. Navigate to the Service Menu. For instructions, see "Accessing the Service Menu" on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-171 on page 4-96).

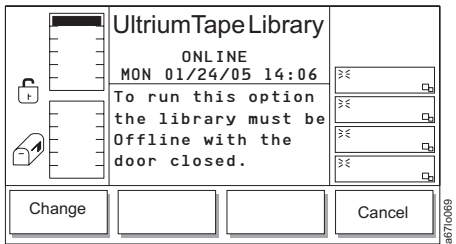


Figure 4-171. Library Submenu

3. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 4-172).

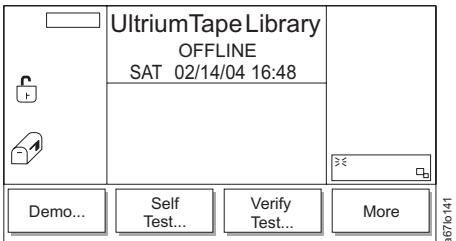


Figure 4-172. Exercise Submenu

4. Press the button below the **Demo** softkey. The Demo Dialog displays (see Figure 4-173).

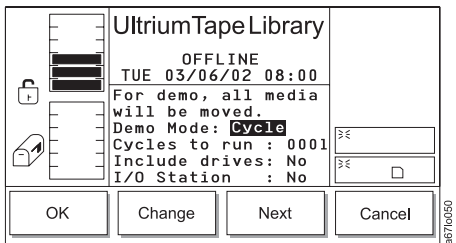


Figure 4-173. Demo Dialog

The Demo Dialog contains the following information:

- | | |
|-----------------------|--|
| Demo Mode | Indicates whether to run the demo based on a quantity of cycles or hours. Valid values are Cycle and Time. |
| Cycles to run | Specifies the number of cycles to run during the demo. This field displays only if you chose Demo Mode: Cycle. Valid values are 1 through 9999. |
| Hours to run | Specifies the number of hours to run the demo. This field displays only if you chose Demo Mode: Time. Valid values are 2 through 24. |
| Include drives | Specifies whether to include drives in the demo. Valid values are Yes (include drives in the demo) or No (do not include drives in the demo). |
| I/O Station | Specifies whether to include the I/O station in the demo. Valid values are Yes (include the I/O station in the demo) or No (do not include the I/O station in the demo). |

5. Perform one of the following:

- To accept the current settings, go to step 6 on page 4-97.

- To change the value in one or more fields, press the button below the **Next** softkey until the selection cursor highlights the value in that field. Perform one of the following:
 - To change the mode of the demo (cycles or hours), press the button below the **Up** or **Down** softkeys until the value that you want displays in the Demo Mode field.
 - To change the number of cycles or hours to run the demo, press the button below the **Next** softkey until the selection cursor highlights the value in the Cycles to run or Hours to run field. Press the button below the **Up** or **Down** softkeys until the value that you want displays.
 - To include drives or the I/O station in the demo, press the button below the **Next** softkey until the selection cursor highlights the value in the Include drives or I/O Station field. The screen automatically refreshes and displays a **Yes/No** softkey (see Figure 4-174). Press the button below the **Yes/No** softkey until the value that you want displays.

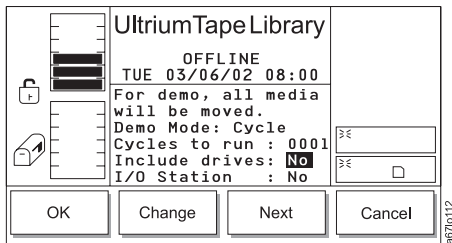


Figure 4-174. Include Drives Dialog

6. Verify that the new settings are correct on the display, then press the button below the **OK** softkey to begin the demo. The Demo Execution screen displays (see Figure 4-175) with a summary of the test settings and a Status field that indicates that the diagnostic is Running. When the test completes, the screen refreshes and the Status field displays Completed.

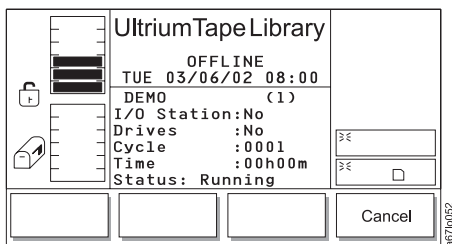


Figure 4-175. Demo Execution screen

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

Performing a Self Test of the Library

The library's self test runs a series of diagnostics to test its sensors, the lock and unlock function of its door, and the movement of all motors. When the library contains drives, the routine also sends communication messages to the drive sleds. No cartridges are moved during the self test. To perform a self test of the library, use the following steps.



**Shortcut: Main Menu (initial screen) → More → Service → Library
→ Exercise → Self Test**

1. Navigate to the Service Menu. For instructions, see "Accessing the Service Menu" on page 4-9.

2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-176).

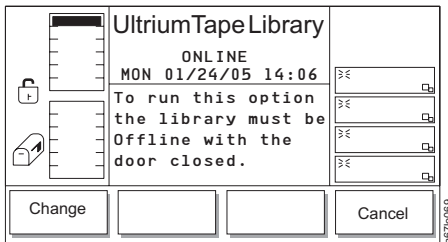


Figure 4-176. Library Submenu

3. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 4-177).

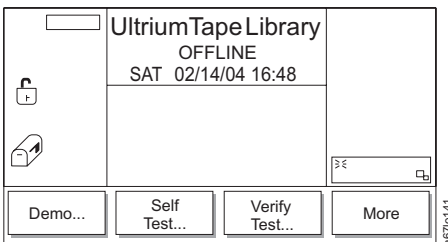


Figure 4-177. Exercise Submenu

4. Press the button below the **Self Test** softkey. The Self Test Dialog displays (see Figure 4-178).

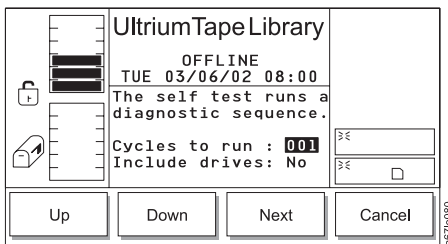


Figure 4-178. Self Test Dialog

The Self Test Dialog contains the following information:

- | | |
|-----------------------|---|
| Cycles to run | Indicates the number of test cycles to run. Valid values are 0 through 999. |
| Include drives | Specifies whether to include drives in the demo. Valid values are Yes (include drives in the self test) or No (do not include drives in the self test). |

5. Perform one of the following:

- To accept the number of cycles to run, press the button below the **Next** softkey to advance the selection cursor to the next field.
- To change the number of cycles to run during the self test, press the button below the **Up** or **Down** softkeys until the value that you want displays. Press the button below the **Next** softkey to advance the selection cursor to the next field.

6. To include or exclude drives in the self test, press the button below the **Next** softkey until the selection cursor highlights the Include drives field. The screen refreshes and the Include Drives Dialog displays

(see Figure 4-179). Press the button below the **Yes/No** softkey until Yes (include drives) or No (exclude drives) displays.

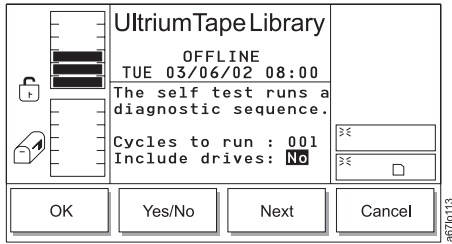


Figure 4-179. Include Drives Dialog

7. Press the button below the **OK** softkey to perform the self test. The Self Test Execution Dialog displays a summary of the test settings and a Status field that indicates that the diagnostic is Running. When the test completes, the screen refreshes and the Status field displays Completed (see Figure 4-180).

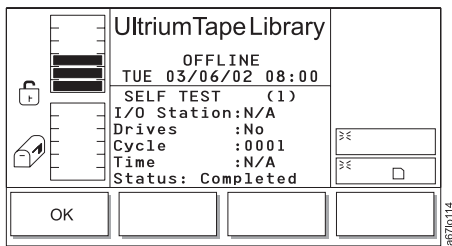


Figure 4-180. Self Test Execution Dialog

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

Performing a Verify Test of the Library

The Verify Test runs the following tests on the library:

- Power On Self Test (POST)
- FAST Read/Write drive test
- A test of the robot range of motion
- A bar code scanner test



Shortcut: Main Menu (initial screen) —> More —> Service —> Library —> Exercise —> Verify Test

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-181 on page 4-100).

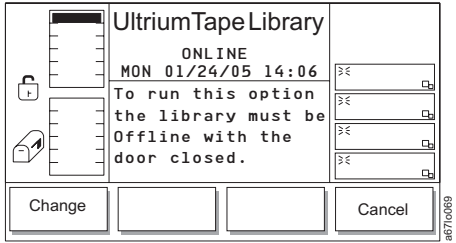


Figure 4-181. Library Submenu

3. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 4-182).

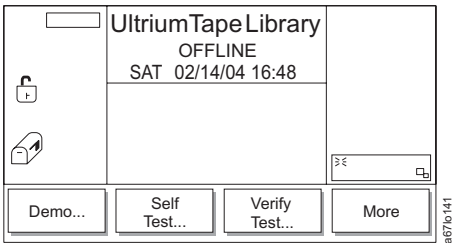


Figure 4-182. Exercise Submenu

4. Press the button below the **Verify Test** softkey. The Verify Test Dialog displays (see Figure 4-183).

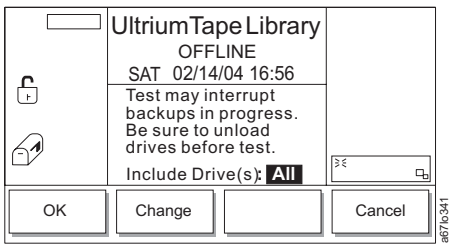


Figure 4-183. Verify Test Dialog

5. In the Verify Test Dialog's Include Drive(s) field, press the button below the **Change** softkey to select one of the following values:

Value	Description
All	Includes all the drives in the test
1 - 6	Includes a specific drive in the test

6. When the correct value is selected, press the button below the **OK** softkey. The Verify Test Scratch Tape Dialog displays (see Figure 4-184 on page 4-101).

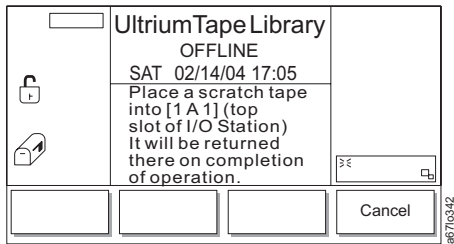


Figure 4-184. Verify Test Scratch Tape Dialog

7. Open the I/O Station.
8. Insert a scratch tape into the top slot of the I/O Station.
9. Close the I/O Station and the library will execute the TEACH and INVENTORY procedures.
10. When the diagnostic begins, the Diagnostic In Progress Screen displays (see Figure 4-185).

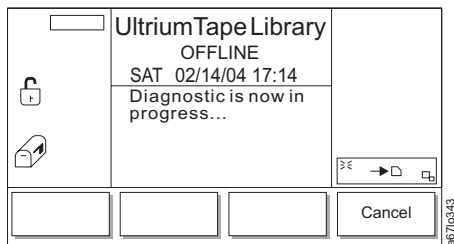


Figure 4-185. Diagnostic In Progress Screen

The library runs a Power On Self Test (POST) to verify the hardware is working properly. Then the library ensures communication with the drives. If the drive(s) have a cartridge loaded, the library moves the cartridge to its home slot. The library then reads the bar code on the scratch tape and moves the scratch tape to the drive(s) and runs a FAST Read/Write test on the tape. The tape is then moved back to slot 1A1, and the bar code is read a second time and compared with the earlier reading.

11. When the tape is returned to the I/O Station, the Command Now Complete Screen displays (see Figure 4-186).

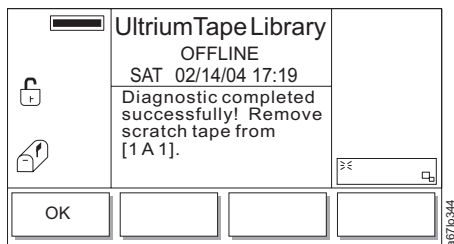


Figure 4-186. Command Now Complete Screen

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

Calibrating the Library

The calibration procedure is also known as Teach. To calibrate the proper position of the gripper in the library, perform the following steps.



**Shortcut: Main Menu (initial screen) → More → Service → Library
→ Exercise → More > Teach**

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-187).

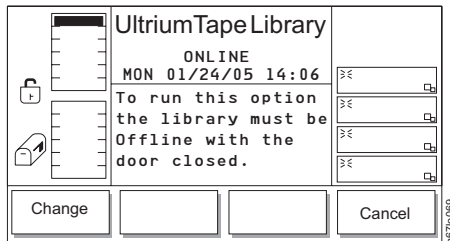


Figure 4-187. Library Submenu

3. Press the button below the **Exercise** softkey. The Exercise Submenu displays (see Figure 4-188).

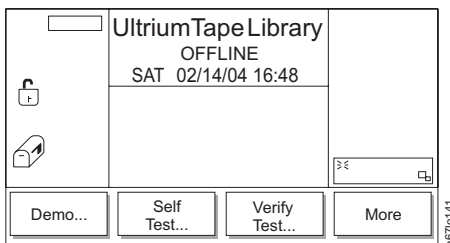


Figure 4-188. Exercise Submenu

4. Press the button below the **More** softkey. The library Exercise Submenu (alternate screen) displays (see

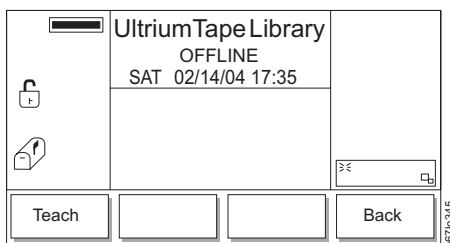


Figure 4-189. Exercise Submenu (alternate screen)

5. Press the button below the **Teach** softkey. The library displays the message **Select OK to Teach**.
6. Press the button below the **OK** softkey to begin the calibration. When the calibration is finished, the library displays the message **The requested Teach completed OK**.
7. To return to the Exercise Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Running Drive Diagnostics

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

The drive diagnostics test the drive's normal and fast read/write capability, as well as the function of its media, head, electrical power, and SCSI circuitry. The sections that follow describe each type of diagnostic.

To select a drive and run a diagnostic on it, perform the following steps:



Shortcut: Main Menu (initial screen) → More → Service → Drives → OK or Change Drive → Diags

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Drives** softkey. The Drives Dialog displays the number of a drive in the library and its current level of firmware (see Figure 4-190).

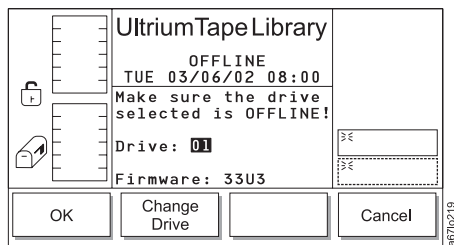


Figure 4-190. Drives Dialog

3. Perform one of the following:
 - To run the diagnostic on the currently displayed drive, press the button below the **OK** softkey.
 - To run the diagnostic on a different drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays. Press the button below the **OK** softkey.

The Drive Service Dialog displays (see Figure 4-191).

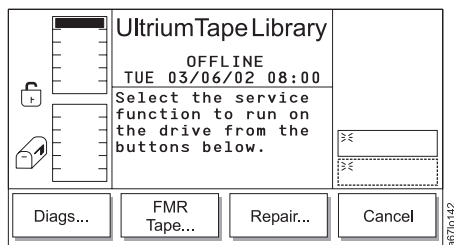


Figure 4-191. Drive Service Dialog

4. Press the button below the **Diags** softkey. The Drive Diagnostics Dialog displays the first of the six diagnostics that you can run on the specified drive (see Figure 4-192 on page 4-104). Each diagnostic is presented one at a time.

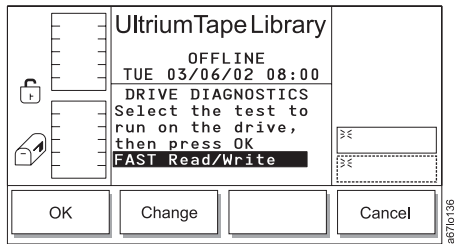


Figure 4-192. Drive Diagnostics Dialog

The Drive Diagnostics Dialog contains the following supported tests:

FAST Read/Write	Performs a load and unload operation, and a read and write test.
NORMAL Read/Write	Performs a load and unload operation, a read and write test, and other related tests. The NORMAL Read/Write test is more comprehensive and longer in duration than the FAST Read/Write test.
Media Read/Write	Tests whether a suspect tape cartridge and its magnetic tape are acceptable.
Head Read/Write	Tests whether a suspect tape cartridge and its magnetic tape are acceptable.
Power On Self Test	Tests the drive's initialization process.
FC/SCSI Wrap Test	Tests the SCSI circuitry.
Error Report	Reports on errors in the event of a drive error condition.

5. Perform one of the following:

- To accept and run the currently displayed drive diagnostic, press the button below the **OK** softkey.
- To specify and run a different drive diagnostic, press the button below the **Change** softkey until the diagnostic that you want displays. Press the button below the **OK** softkey.

6. Perform one of the following:

- For the FAST Read/Write, NORMAL Read/Write, Media Read/Write, and Head Read/Write diagnostic, open the door of the I/O station and insert a scratch tape into the top slot. Close the door of the I/O station and press the button below the **OK** softkey.
- For the Power On Self Test, press the button below the **OK** softkey.
- For the SCSI Wrap Test connect the SCSI wrap tool to one SCSI port of the drive and the single-ended terminator that was shipped with the drive to the other SCSI port of the drive, and press the button below the **OK** softkey.

The library begins the diagnostic. When the test is complete, the library displays the message **Requested command is now complete.**

7. To return to the Drive Diagnostics Dialog, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Cancel** and **Back** softkeys until the Main Menu displays.

Creating or Erasing an FMR Tape

Before you can create a field microcode replacement (FMR) tape, you must have previously obtained the new firmware file by downloading it from the web, ordering it on a CD or diskette, or copying it from a drive that is already loaded with the new firmware.

To download the new firmware file from the web, visit <http://www.ibm.com/storage/1to>.

To order the new firmware file on a CD or diskette, contact your IBM Service Representative.

To copy an FMR tape from a drive that is already loaded with the new firmware, refer to the steps in this procedure.



Shortcut: Main Menu (initial screen) → More → Service → Drives
→ OK → FMR Tape

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Drives** softkey. The Drives Dialog displays the message **Make sure the drive selected is OFFLINE!** and the number of a drive in the library (see Figure 4-193). Ensure that the drive has completed all operations and that no backup applications are running. Within the drive column, drives are numbered 01 through 06 from bottom to top.

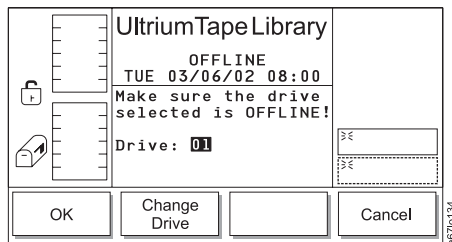


Figure 4-193. Drives Dialog

3. Perform one of the following:
 - To accept the current drive, press the button below the **OK** softkey.
 - To specify a different drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays. Press the button below the **OK** softkey.

The Drive Service Dialog displays (see Figure 4-194).

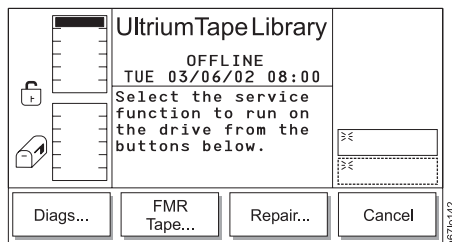


Figure 4-194. Drive Service Dialog

4. Press the button below the **FMR Tape** softkey. The FMR Tape Dialog displays (see Figure 4-195 on page 4-106) with the Create or Erase function highlighted.

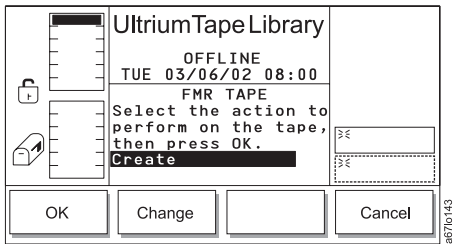


Figure 4-195. FMR Tape Dialog

5. Perform one of the following:

- To accept the currently displayed function (Create or Erase), press the button below the **OK** softkey.
- To specify another function, press the button below the **Change** softkey until the function that you want displays. Press the button below the **OK** softkey.

The Scratch Tape Dialog displays (see Figure 4-196).

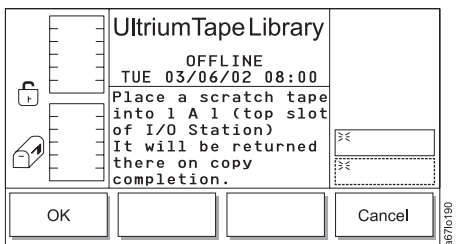


Figure 4-196. Scratch Tape Dialog

6. Open the door of the I/O station and insert a scratch tape into the top slot. Close the door of the I/O station and press the button below the **OK** softkey. The library creates or erases the FMR tape, displays status messages, and returns the newly created FMR tape to its original slot. When the task is complete, the library displays the message **Requested command is now complete.**
7. To return to the Scratch Tape Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey. Then press the button below the **Cancel** softkey until the Main Menu displays (or press the button below the **Change** softkey to erase the FMR tape).

Removing and Replacing a Tape Drive

- | **Note:** (*Ultrium 3 drives only*) Before removing and replacing a tape drive, perform a Preserve Dump to gather diagnostic information about the drive. See “Performing a Preserve Dump” on page 4-36 for more information.
- | The Repair option is used to inform the library that a drive is about to be taken out of the library. Communication to the drive will discontinue until the drive has been replaced.

To notify the library that a drive is being removed or replaced, perform the following steps:

Note: To physically remove or replace a tape drive, see the appropriate section in the *IBM Ultrium Scalable Tape Library Maintenance Information* manual.



Shortcut: Main Menu (initial screen) → More → Service → Drives → OK → Repair

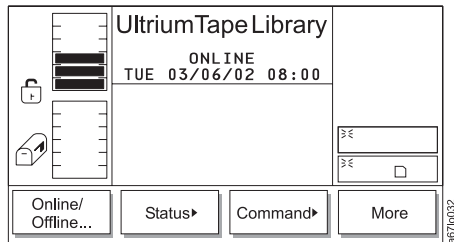


Figure 4-197. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **More** softkey. The Main Menu's alternate screen displays (see Figure 4-198).

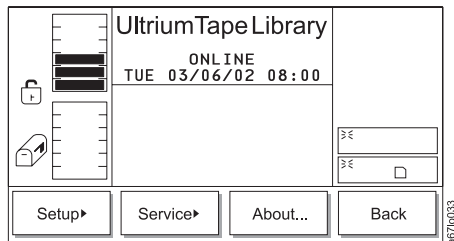


Figure 4-198. Main Menu (alternate screen)

2. Press the button below the **Service** softkey. The Service Menu displays (see Figure 4-199 on page 4-108).

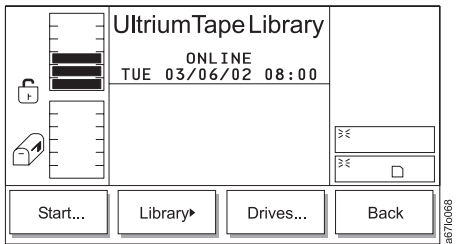


Figure 4-199. Service Menu

3. Press the button below the **Drives** softkey. The Drives Dialog displays the number of a drive in the library (see Figure 4-200). Within the drive column, drives are numbered 01 through 06 from bottom to top.

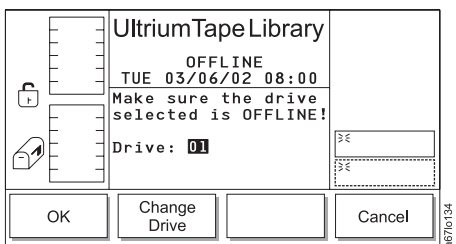


Figure 4-200. Drives Dialog

4. Perform one of the following:
 - To accept the current drive, press the button below the **OK** softkey.
 - To specify a different drive, press the button below the **Change Drive** softkey until the number of the drive that you want displays. Press the button below the **OK** softkey.

The Drive Service Dialog displays (see Figure 4-201).

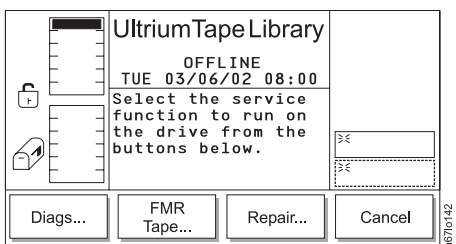


Figure 4-201. Drive Service Dialog

5. Press the button below the **Repair** softkey. The Repair Dialog displays (see Figure 4-202 on page 4-109) with the Remove or Replace function highlighted.

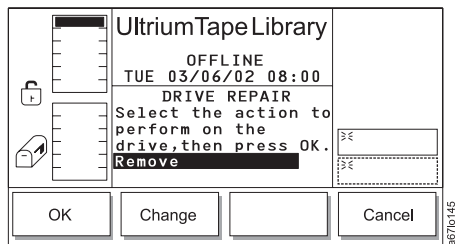


Figure 4-202. Repair Dialog

6. Perform one of the following:

- To accept the currently displayed function (Remove or Replace), press the button below the **OK** softkey.
- To specify another function, press the button below the **Change** softkey until the function that you want displays. Press the button below the **OK** softkey.

When the task is complete, the library displays the message **Requested command is now complete.**

7. Press the button below the **OK** softkey. The library displays the message **You can now remove the drive** or **You can now replace the drive.** To physically remove or replace a tape drive, see the appropriate section in the *IBM Ultrium Scalable Tape Library Maintenance Information* manual.
8. To return to the Repair Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey. Then press the button below the **Cancel** and **Back** softkeys until the Main Menu displays.

Note: Allow a few moments for the library and drives to reinitialize.

Viewing the Library's Serial Number and Firmware Level

To display the library's serial number, firmware version, and application and boot code for the picker, drive sleds, main board, and display, perform the following steps:



Shortcut: Main Menu (initial screen) → More → About → Details → OK

1. Navigate to the About... Menu. For instructions, see "Accessing the About the Library (About...) Menu" on page 4-10.
2. To view the library's current application and boot code for the picker, drive sleds, main board, and display, press the button below the **Details** softkey. The Detail Dialog displays (see Figure 4-203). Continue to press the button below the **Details** softkey until all details have displayed.

Note: All code levels must be the same. However, if the boot code is at 02.01.0001 or above, it does not have to match the other code levels.

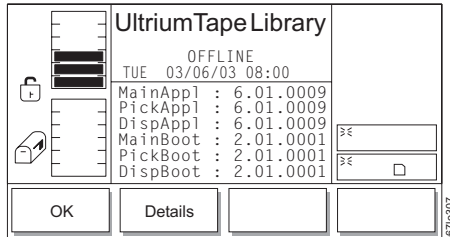


Figure 4-203. Detail Dialog

3. To return to the Main Menu (alternate screen), press the button below the **OK** softkey. To return to the Main Menu (initial screen) press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Setting the Length of the Media's VOLSER

You can extend the length of the volume serial number (VOLSER) on your cartridge's bar code label. To set the length, perform the following steps.



**Shortcut: Main Menu (initial screen) → More → Setup → Library
→ MEDIA**

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.
2. Press the button below the **Library** softkey. The Library Submenu displays (see Figure 4-204).

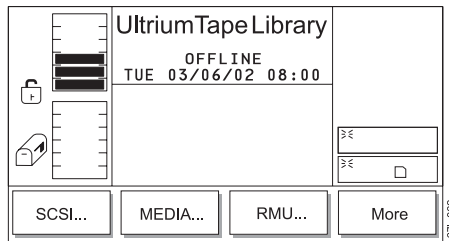


Figure 4-204. Library Submenu

3. Press the button below the **MEDIA** softkey. The Media Dialog displays the Volser field (see Figure 4-205). Available settings are:

- DEFAULT** A bar code label of up to 6 characters.
- EXTENDED** A bar code label of between 5 and 16 characters.

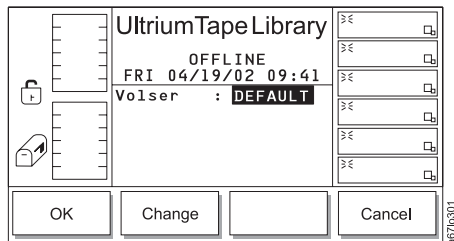


Figure 4-205. Media Dialog

4. Press the button below the **Change** softkey so that the Volser field changes to EXTENDED (see Figure 4-206).

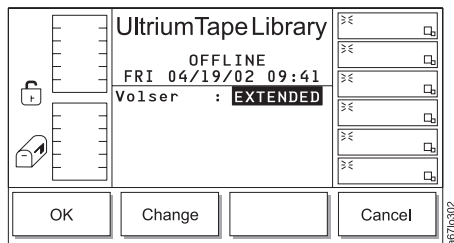


Figure 4-206. Media Dialog with the Volser field set to EXTENDED

5. Press the button below the **OK** softkey. The Reinventory screen displays (see Figure 4-207).

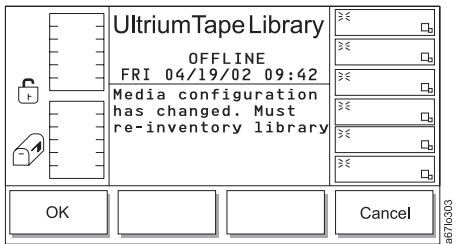


Figure 4-207. Reinventory screen

6. Press the button below the **OK** softkey. The library reinventories the cartridges and returns to the Library Submenu (see Figure 4-204 on page 4-111).
7. To return to the Main Menu, press the button below the **More** softkey, then press the button below the **Back** softkey until the Main Menu displays.

Uploading Library Error Log Information by Using the RMU

The RMU's Diagnostics file page is protected by a password and allows you to upload (to a local computer) the diagnostic information from the attached library. The diagnostic information may be useful to service personnel in diagnosing problems. Information from the library (command and error logs) and information from the RMU's Error Log can be retrieved in text form by selecting the Diagnostics file page or Logs page from the RMU. Also included are the error log and drive dump to each drive in the library. (The library and drive logs are typically used by service personnel only.)



Figure 4-208. Diagnostics file page

Updating Firmware

Attention::

1. To ensure optimum performance from the Ultrium Scalable Tape Library, use the latest level of firmware. It is the customer's responsibility to obtain and install all firmware.
2. Before visiting the web to obtain the latest level of library firmware, you must determine which generation of library firmware that you have. Library firmware for a library without the Multi-Path feature starts with 3.xx.xxxx; library firmware for a library with the Multi-Path feature starts with 5.xx.xxxx. A library without the Multi-Path feature cannot be loaded on a library that is already enabled with the Multi-Path feature.

You can update firmware for the drives, the library, or the RMU by using the following methods:

- RMU
- SCSI bus
- FMR tape (drive firmware only)
- Library serial port (library firmware only)
- San Data Gateway Module (optional, if the library has an optional San Data Gateway Module installed)

Tools and Methods Available for Tape Drive and Library Firmware Updates

- I Instructions for using the following tools and methods for updating firmware are included in this document.
- "ITDT SCSI Firmware Update, Dump Retrieval, and Library/Drive Test Tool" on page 4-115
 - "LTO-TDX SCSI Tape Drive Firmware Update and Drive Dump Retrieval Tool" on page 4-115
 - "SCSI NTUTIL (Windows) and TAPEUTIL (AIX) Drive and Library Firmware Update Tools" on page 4-115
 - "RMU Method" on page 4-115
 - "FMR Cartridge (Drive Only)" on page 4-115
 - "SAN Data Gateway Firmware Update" on page 4-115

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 web site (<http://www.ibm.com/storage/ito>) .

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/ito>. 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 SCSI Tape Drive Firmware Update and Drive Dump Retrieval Tool

This is a command line tool available on the IBM web site and explained fully in the Tape Drive Firmware Update section. This tool is also device driver independent.

SCSI NTUTIL (Windows) and TAPEUTIL (AIX) Drive and Library Firmware Update Tools

Both of these tools require the IBM device drivers to be installed. If the application does not use the IBM device drivers, the application drivers must first be stopped. A full explanation of these tools are located in both the library and drive firmware update sections.

RMU Method

The RMU is a library component method which can be used to update firmware in all library components (library, drive and RMU). The RMU method is a convenient method, however, drive updates will take about 1 hour. The RMU method is the only method listed to update the RMU itself. The RMU method is explained in all firmware update sections.

Library Serial Port Method

The library serial port can be used to update firmware in the library only. A special firmware update executable (3583DLMP.exe) is required and is located on the IBM web site.

FMR Cartridge (Drive Only)

Under certain circumstances where none of the above tools or methods can be used, tape drive FMR cartridges are available to update the tape drive firmware.

SAN Data Gateway Firmware Update

The SAN Data Gateway Module firmware can be updated using one of the following two methods (both methods are explained in the SAN Data Gateway Setup, Operator, and Service Guide):

1. The Controls pull down menu on the client/server software (ethernet). This is the most convenient method and recommended method.
2. The SAN Data Gateway Module serial port.

Installation Overview

Complete the following steps to update library, drive, RMU, and SAN Data Gateway firmware:

- “Step 1. Register for My Support”
- “Step 2. Determine current firmware levels installed on your library” on page 4-117
- “Step 3. Download latest firmware from the web” on page 4-118
- “Step 4. Update RMU firmware” on page 4-119
- “Step 5. Update library firmware” on page 4-120
- “Step 6. Update drive firmware” on page 4-125
- “Step 7. Update SAN Data Gateway firmware” on page 4-131

For instructions on completing each step, refer to the sections that follow.

Step 1. Register 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:

1. Visit the web at <http://www.ibm.com/support/mySupport>.
2. Under **We use IBM Registration**, click on **Register**.
3. Fill in the information required for registration. Items with an asterisk (*) are required fields.
4. Login. Enter your **User ID** and **Password** and click **Go** to access My Support.
5. Enter the information required for your **My support profile**.
 - a. Under **Select a product family:**, select **Computer Storage** and click on **Go**.
 - b. Under **Computer Tape Storage**, select **Computer Tape Libraries**.
 - c. Click **Save & return** at the bottom of the page.
 - d. Review your profile for correctness.
 - e. Under **Select mail preferences**, check the boxes labeled **Flashes** and **Downloadable files**, and click **Submit**.
 - f. Under **Welcome, (your name)**, click on **Sign out** to end your session.

Step 2. Determine current firmware levels installed on your library

While determining levels of firmware currently installed on your library, record these firmware levels in Table 4-1.

After determining the current levels of firmware installed on your library, determine the latest levels of firmware that are available for the library, drives, RMU, and SAN Data Gateway. For information on determining the latest levels of firmware available and downloading the firmware, see “Step 3. Download latest firmware from the web” on page 4-118.

Table 4-1. Firmware levels

Device	Currently Installed Firmware Levels	Latest Firmware Level on Web
LTO Ultrium 1 Tape Drive SCSI		
LTO Ultrium 2 Tape Drive SCSI		
LTO Ultrium 2 Tape Drive Fibre		
LTO Ultrium 3 Tape Drive LVD SCSI		
LTO Ultrium 3 Tape Drive Fibre		
Non-Multi-Path Library (firmware below 4.99.002)		
Non-Multi-Path RMU		
Multi-Path Library (firmware above 5.14.0001)		
Multi-Path RMU		
SAN Data Gateway Firmware		

Determining current level of library firmware

To determine the version of library firmware using the 3583 display:

1. Select **More**.
2. Select **About**.
3. Record the current firmware version of the library in Table 4-1 for use later in this procedure.

Determining current level of RMU firmware

To determine the version of RMU firmware using the 3583 display:

1. Select **Details** in the **About Menu** screen.
2. Scroll down until *RMU* displays.
3. Record the current firmware version of the RMU in Table 4-1 for use later in this procedure.
4. Press **OK** then **Back** to return to the **Main Menu** initial screen.

Determining current level of drive firmware

To determine the version of drive firmware using the 3583 display:

1. Select **Status**.
2. Select **Drives**.
3. Record the current firmware version of each drive in Table 4-1 for use later in this procedure.
4. Select **OK** then **Back** to return to the **Main Menu**.

Determining current level of SAN Data Gateway firmware

To determine the SAN Data Gateway firmware level, refer to “Determining the level of firmware on the SAN Data Gateway Module” on page 4-131. Record the current firmware level of the SAN Data Gateway in Table 4-1.

Step 3. Download latest firmware from the web

Note: Before updating firmware on the drives, the library, or the RMU, use your server to set the library and drives OFFLINE for all attached servers.

To find out whether the drives, the library, the RMU, or the SAN Data Gateway are loaded with the most current firmware:

1. Visit the web at <http://www.ibm.com/storage/lto> .
2. Compare the latest level of firmware against the firmware currently on your device (library, drive, or RMU).
3. If the latest level available is at a higher number than the firmware currently on your device:
 - a. Record the latest level firmware number in Table 4-1 on page 4-117.
 - b. Download the firmware onto your server.

For the SAN Data Gateway Client/Server Software, the ITDT Library and Drive Firmware Download Tool, and the LTO-TDX Drive Firmware Download 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 web site (<http://www.ibm.com/storage/lto>) .

- Visit the web at <http://www.ibm.com/storage/lto> .

Note: Update your Library Configuration Form with the latest firmware level information.

Step 4. Update RMU firmware

If you have not already done so, determine the current version of RMU firmware installed on your library. For instructions, see “Determining current level of RMU firmware” on page 4-117.

Note: If the RMU firmware is down-level use the RMU to update the RMU firmware.

- If the RMU has a firmware version lower than the level recorded in Table 4-1 on page 4-117 then you should install the new RMU firmware. See “Step 3. Download latest firmware from the web” on page 4-118, then go to “Updating RMU firmware.”
- If the RMU firmware is already at the latest level, proceed to “Step 5. Update library firmware” on page 4-120.

Updating RMU firmware

Note: Ensure that you have downloaded the latest firmware from <http://www.ibm.com/storage/1to>

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the xxxx.lif file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist using the RMU IP address.
- ___ 5. Select the Firmware tab (login, if necessary). The firmware page displays.
- ___ 6. Select **RMU**.
- ___ 7. Enter the path and filename of the library firmware file, or browse for the file.
- ___ 8. Select **Update Firmware**.
- ___ 9. Wait for the firmware update to complete.
- ___ 10. Verify that the firmware update completed successfully by checking the RMU firmware version as described in “Determining current level of RMU firmware” on page 4-117.
 - If the RMU firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully. Proceed to “Step 5. Update library firmware” on page 4-120.
 - If the RMU firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 5. Update library firmware

If you have not already done so, determine the current version of library code installed on your library. For instructions, see “Determining current level of library firmware” on page 4-117.

- If the library has a firmware version lower than the level recorded in Table 4-1 on page 4-117 then you should install the new library firmware. See “Step 3. Download latest firmware from the web” on page 4-118, then go to “Updating library firmware.”
- If the library firmware is at the latest level, proceed to “Step 6. Update drive firmware” on page 4-125.

Note: In most cases the host server provides alternate methods of determining the Inquiry information - including the firmware version - of attached SCSI devices. These methods (such as TapeUtil or NTUtil) may be used if you are familiar with them, but they are not covered in these instructions.

Updating library firmware

Important: If the library firmware is currently at version 2.6x.xxxx, do NOT use the SCSI method to update the library firmware. Instead, use the RMU or serial port methods.

Attention: When updating library firmware, do not power-off the 3583 Library for at least 5 minutes after the update is complete or the library may become unusable.

Review the following methods of updating library firmware to determine which method you should use:

- **Using the RMU:** To update library firmware using the Remote Management Unit (RMU), go to “Updating library firmware using the RMU.”

Note: If your library has an RMU and you are familiar with using a web browser to work with the library then the RMU method is recommended. If your library does not have an RMU the serial port method is recommended.

- **Using the library serial port:** To update library firmware using the library serial port and the download program, go to “Updating library firmware using the library serial port” on page 4-121.
- **Using SCSI:** To update library firmware using SCSI, go to “Updating library firmware using SCSI” on page 4-121.

Updating library firmware using the RMU:

Note: Ensure that you have downloaded the latest firmware from <http://www.ibm.com/storage/lto>

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Vx_xx_xx.lif file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist using the RMU IP address.
- ___ 5. Select the Firmware tab (login, if necessary). The firmware page displays.
- ___ 6. Select **Update Library Firmware**.
- ___ 7. Enter the path and filename of the library firmware file, or browse for the file.
- ___ 8. Select **Update Firmware**.
- ___ 9. Wait for the firmware update to complete. The library will reboot and run its Power On Self Test (POST).
- ___ 10. Verify that the firmware update completed successfully by checking the library firmware version as described in “Determining current level of library firmware” on page 4-117.
 - If the library firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully. Go to “Step 6. Update drive firmware” on page 4-125.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware using the library serial port:

Note: Ensure that you have downloaded the latest firmware and executables from <http://www.ibm.com/storage/1to>. For Non-Multi Path use download.exe and for Multi Path use 3583DLMP.exe. You will need the firmware and the executable in the same directory.

To use this procedure you must have a pass-through serial cable (provided with the library) connected between the library serial port and the serial (COM) port on a PC running DOS or Windows95/98/NT/2000.

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Vx_xx_xx.lif file from the temporary directory on the server.
- ___ 4. Locate the download.exe (for non-multi-path libraries) or 3583DLMP.exe (for multi-path libraries) file from the temporary directory on the server.
- ___ 5. On the PC, go to a command prompt and change directory (CD) to the temporary directory where the library firmware and download.exe or 3583DLMP.exe files are located. As an example, if the files are located in C:\TEMP, type CD \TEMP and press Enter.
- ___ 6. Type **DOWNLOAD -C1 -F<filename>.lif** (for non-Multi-Path) or **3583DLMP -C1 -F<filename>.lif** (for Multi-Path). Then press Enter.

Note: Characters C and F are case sensitive - they must be capitalized.

Note: -C specifies the PC serial port number. -C1 is COM1. If you are using COM2 change the -C1 to -C2 etc.

Note: -F<filename> specifies the file name of the library firmware to be downloaded.

- ___ 7. Wait for the firmware update process to complete. The library will reboot and run its POST.
- ___ 8. Verify that the firmware update completed successfully by checking the library firmware version as described in “Determining current level of library firmware” on page 4-117.
 - If the library firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully. Go to “Step 6. Update drive firmware” on page 4-125.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware using SCSI: Use the following information to assist you in downloading library firmware from your server (host system) over the SCSI bus using the device drivers and utilities supplied by IBM.

For more detailed information about using the IBM device drivers and utilities (NTUTIL or TAPEUTIL), refer to the *IBM Ultrium Device Drivers Installation and User's Guide* that was shipped with the library. For the latest version of the User's Guide, visit the web at <http://www.ibm.com/storage/1to>.

- I • For information on the most efficient method of updating library firmware, go to “Updating Library Firmware over the SCSI bus using the ITDT Tool” on page 4-122.

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 web site (<http://www.ibm.com/storage/ito>) .

- If the library is connected to a Windows server, go to “**Updating library firmware over the SCSI bus using NTUTIL (Windows)**.”
- If the library is connected to a Unix server, go to “**Updating library firmware over the SCSI bus using TAPEUTIL (Unix)**” on page 4-123.

Note: Unix includes AIX, Sun Solaris, HP-UX, Linux, etc.

Updating Library Firmware over the SCSI bus using the ITDT Tool: For information on the ITDT Tool, see “ITDT SCSI Firmware Update, Dump Retrieval, and Library/Drive Test Tool” on page 4-115.

Updating library firmware over the SCSI bus using NTUTIL (Windows):

The following procedure describes how to update the library firmware using NTUTIL.

- ___ 1. If you have not already done so, install the IBM Ultrium Device Driver.
- ___ 2. If you are using a software application that utilizes a different device driver, you will need to stop that device driver and then start the IBM Ultrium Device Driver. To start or stop a device driver perform the following steps:

- Windows NT:

- ___ a. Click on the Windows START button.
- ___ b. Select Settings, then click on Control Panel.
- ___ c. Double-click on Devices.
- ___ d. Scroll down to the device driver you want to start/stop.
- ___ e. Click on the device driver to highlight it.
- ___ f. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- Windows 2000:

- ___ a. Click on the Windows START button.
- ___ b. Select Settings, then click on Control Panel.
- ___ c. Double-click on Administrative Tools.
- ___ d. Double-click on Computer Management.
- ___ e. Click on Device Manager.
- ___ f. Scroll down to the device driver you want to start/stop.
- ___ g. Click on the device driver to highlight it.
- ___ h. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- ___ 3. Open a Command Prompt and change the prompt to the temporary directory where you downloaded and extracted the firmware file. As an example, if the firmware file is in C:\TEMP then type **CD \TEMP** and press Enter.
- ___ 4. Type **NTUTIL** and press Enter.
- ___ 5. Type **1** and press Enter to select Manual Test.
- ___ 6. Type **8** and press Enter to select Library Mode.
- ___ 7. Type **88** and press Enter to select List registered devices.
- ___ 8. Write down the tape and library paths for use later in this procedure.
- ___ 9. Type **1** and press Enter to set device special file.
- ___ 10. Type the name of a tape path displayed in the previous step and press Enter. Then type the name of the library path displayed in the previous step and press Enter.
- ___ 11. Type **20** and press Enter to open both the drive and media changer. When prompted to select a Mode, type **1** and press Enter to select Read/Write mode.
- ___ 12. Type **49**, press Enter, then choose "library" or "drive".
- ___ 13. At the NTUtil Command Prompt, type **82** to update microcode.
- ___ 14. Follow the instructions to select the device you want to update.
- ___ 15. When prompted to enter the FMR name, type the file name of the library firmware file **without the .lif extension** and press Enter.

Note: Updating the library firmware using NTUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 16. Close the NTUTIL session.
- ___ 17. Verify that the firmware update completed successfully by checking the library firmware version as described in "Determining current level of library firmware" on page 4-117.
 - If the library firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully. Go to "Step 6. Update drive firmware" on page 4-125.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware over the SCSI bus using TAPEUTIL (Unix):

The following procedure describes how to update the library firmware in the 3583 Tape Library over the SCSI bus using TAPEUTIL.

Note: Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* for instructions on usage of the TAPEUTIL utility for the particular Operating System that the device is attached to. This document is also available on the IBM website, <http://www.ibm.com/storage/1to>. The instructions below are given as an example and refer to the AIX Operating System.

- ___ 1. Change the current directory to the temporary directory where the library firmware file is located.

Note: Make note of the exact filename of the firmware that is to be used (case sensitive).

- ___ 2. Ensure that the library is **Available** (not just defined) to the Atape device driver by listing the devices. Use the command **lsdev -Cc tape**.
- ___ 3. Open a TAPEUTIL session.
- ___ 4. Select option 4 - tape drive service aids.
- ___ 5. Select Microcode load.
- ___ 6. Select the library device you want to upgrade.

- ___ 7. Enter the exact filename you noted in step 1 on page 4-123.
- ___ 8. Press F7 Commit.

Note: Updating the library firmware using TapeUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 9. Close the TAPEUTIL session.
- ___ 10. Verify that the firmware update completed successfully by checking the library firmware version as described in “Determining current level of library firmware” on page 4-117.
 - If the library firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully. Go to “Step 6. Update drive firmware” on page 4-125.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 6. Update drive firmware

If you have not already done so, determine the current level of drive firmware. For instructions, see “Determining current level of drive firmware” on page 4-117.

- If any drive has a firmware version lower than the level recorded in Table 4-1 on page 4-117, then you should install the new drive firmware. See “Step 3. Download latest firmware from the web” on page 4-118, then go to “Updating drive firmware.”
- If the drive firmware in all drives is already at the latest level, proceed to “Step 7. Update SAN Data Gateway firmware” on page 4-131.

Note: In most cases the host server provides alternate methods of determining the Inquiry information - including the code version - of attached SCSI devices. These methods (such as TapeUtil or NTUtil) may be used if you are familiar with them, but they are not covered in these instructions.

Updating drive firmware

Attention: When updating drive firmware, do not power-off the 3583 Library for at least 5 minutes after the update is complete or the drives may become unusable.

Review the following methods of updating drive firmware to determine which method you should use:

- **Over the SCSI bus using the ITDT Tool:** To update drive firmware using the new SCSI ITDT tool, go to “Updating drive firmware over the SCSI bus using the ITDT Tool” on page 4-126.

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 web site (<http://www.ibm.com/storage/ito>) .

- **Over the SCSI bus using the LTO-TDX Tool:** To update drive firmware using the SCSI LTO-TDX tool (for Windows, Linux, and Netware), go to “Updating drive firmware over the SCSI bus using the LTO-TDX Tool” on page 4-126.

Note: The LTO-TDX tool is the most efficient method for downloading LTO drive firmware across the SCSI bus or fibre channel. This is the recommended method for updating drive firmware. The LTO-TDX tool is not device driver dependent.

- **Using the RMU:** To update drive firmware using the Remote Management Unit (RMU), go to “Updating drive firmware using the RMU” on page 4-129.

Note: If your library has an RMU and you are familiar with using a web browser to work with the library then the RMU method is recommended because it is easy. However it takes approximately 60 minutes to update the first drive and 15 minutes for each additional drive.

- **Over the SCS bus using NTUTIL or TAPEUTIL:** To update drive firmware using the SCSI NTUTIL (Windows) or TAPEUTIL (Unix) tools, go to “Updating drive firmware using SCSI.”
- **Using an FMR Tape:** To update drive firmware using an FMR tape, go to “Updating drive firmware using an FMR tape” on page 4-130.

Note: The FMR tape method is only used when the library is attached to an iSeries (AS/400) host server.

Updating drive firmware using SCSI: There are two methods for updating drive firmware using the SCSI bus. ITDT or LTO-TDX is the preferred method for updating drive firmware using the SCSI bus. NTUTIL and TAPEUTIL are alternate methods and are described in following sections.

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 web site (<http://www.ibm.com/storage/lto>) .

Note: LTO-TDX also has drive dump capture capabilities

Updating drive firmware over the SCSI bus using the ITDT Tool: To update drive firmware using the new ITDT tool, go to "ITDT SCSI Firmware Update, Dump Retrieval, and Library/Drive Test Tool" on page 4-115.

Updating drive firmware over the SCSI bus using the LTO-TDX Tool:

The tool, LTO-TDX, is the most efficient method for downloading LTO drive firmware across the SCSI bus or fibre channel. In addition, this tool can be used to upload LTO drive dumps. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO Gen 1 and Gen 2 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 to a host system (see "**Drive dump function**" on page 4-127)
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 shall 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 to make sure the drive is not in use when firmware is downloaded or a dump is taken. He also must remove any cartridge 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, the tool will inform the user that there are none 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 does a check 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 shall be asked to remove the cartridge.
3. The tool downloads code to IBM LTO drives ONLY. The tool shall recognize ULT3580-TDX inquiry string devices as well as ULTRIUM-TDX devices. The letter "X" could be 1, 2, 3, or 4.
4. The tool is capable of loading back 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. A message is displayed saying "Updating.....Please Wait" until the reboot is complete. A progress gauge is displayed letting the user know something is still happening.
7. A "Wait" message is displayed on the user screen during firmware load.
8. If the program tries to load code and it 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 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 month, day, hour, minutes, 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 drive firmware over the SCSI bus using NTUTIL (Windows):

The following procedure describes how to update the drive firmware using NTUTIL.

- ___ 1. If you have not already done so, install the IBM Ultrium Device Driver.
- ___ 2. If you are using a software application that utilizes a different device driver, you will need to stop that device driver and then start the IBM Ultrium Device Driver. To start or stop a device driver perform the following steps:
 - Windows NT:
 - ___ a. Click on the Windows START button.
 - ___ b. Select Settings, then click on Control Panel.
 - ___ c. Double-click on Devices.
 - ___ d. Scroll down to the device driver you want to start/stop.
 - ___ e. Click on the device driver to highlight it.
 - ___ f. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- Windows 2000:

- ___ a. Click on the Windows START button.
- ___ b. Select Settings, then click on Control Panel.
- ___ c. Double-click on Administrative Tools.
- ___ d. Double-click on Computer Management.
- ___ e. Click on Device Manager.
- ___ f. Scroll down to the device driver you want to start/stop.
- ___ g. Click on the device driver to highlight it.
- ___ h. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- ___ 3. Open a Command Prompt and change the prompt to the temporary directory where you downloaded the firmware file. As an example, if the firmware file is in C:\TEMP then type **CD \TEMP** and press Enter.
- ___ 4. Type **NTUTIL** and press Enter.
- ___ 5. Type **1** and press Enter to select Manual Test.
- ___ 6. Type **88** and press Enter to select List registered devices.
- ___ 7. Write down the tape and library paths for use later in this procedure.
- ___ 8. Type **1** and press Enter to set device special file.
- ___ 9. Type the name of a tape path displayed in the previous step and press Enter. Then type the name of the library path displayed in the previous step and press Enter.
- ___ 10. Type **20** and press Enter to open both the drive and media changer. When prompted to select a Mode, type **1** and press Enter to select Read/Write mode.
- ___ 11. Type **49** and press Enter to issue an Inquiry to verify that you have established a connection to the library.
- ___ 12. At the NTUtil Command Prompt, type **82** to update microcode.
- ___ 13. Follow the instructions to select the device you want to update.
- ___ 14. When prompted to enter the FMR name, type the file name of the drive firmware file **without the .ro extension** and press Enter.

Note: Updating the drive firmware using NTUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 15. Repeat this procedure starting from step 8 for each drive.
- ___ 16. Close the NTUTIL session.
- ___ 17. Verify that the firmware update completed successfully by checking the drive firmware version as described in "Determining current level of drive firmware" on page 4-117.
 - If the drive firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the drive firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating drive firmware over the SCSI bus using TAPEUTIL (Unix):

Note: Unix includes AIX, Sun Solaris, HP-UX, Linux, etc.

The following procedure describes how to update the tape drive firmware in the 3583 Tape Library over the SCSI bus using TAPEUTIL.

Note: Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* for instructions on usage of the TAPEUTIL utility for the particular Operating System that the device is attached to. This document is also available on the IBM website, <http://www.ibm.com/storage/1to>. The instructions below are given as an example and refer to the AIX Operating System.

- ___ 1. Change the current directory to the temporary directory where the drive firmware file is located.

Note: Make note of the exact filename of the firmware that is to be used (case sensitive).

- ___ 2. Ensure that the drive is **Available** (not just defined) to the Atape device driver by listing the devices. Use the command **lsdev -Cc tape**.
- ___ 3. Open a TAPEUTIL session.
- ___ 4. Select option 4 - tape drive service aids.
- ___ 5. Select microcode load.
- ___ 6. Enter the exact filename you noted in step 1.
- ___ 7. Press F7 Commit.

Note: Updating the tape drive firmware using TapeUtil takes about 5 minutes. When the firmware update process has been completed the tape drive will reset itself and go through a normal power on process.

- ___ 8. For additional drives, repeat this procedure starting at step 4.
- ___ 9. Close the TAPEUTIL session.
- ___ 10. Verify that the firmware update completed successfully by checking the drive firmware version as described in "Determining current level of drive firmware" on page 4-117.
 - If the tape drive firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the drive firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating drive firmware using the RMU:

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Ultrium1 code xxxxL1S.ro file or Ultrium 2 code xxxxL2S.ro (for SCSI) or xxxxL2F.ro (for Fibre) file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist.
- ___ 5. Select the Firmware tab (login, if necessary). The RMU firmware page displays.
- ___ 6. Select a drive(s) to update.
- ___ 7. Press and hold the **Ctrl** key and left click on each drive you want to update.

Note: If your library has multiple drive types, only select one drive type to update.

- ___ 8. Enter the path and filename of the drive firmware file, or browse for the file.
- ___ 9. Select **Update Firmware**.
- ___ 10. Wait for the firmware update to complete.

- ___ 11. Verify that the firmware update completed successfully by checking the drive firmware version as described in “Determining current level of drive firmware” on page 4-117.
 - If the drive firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.
 - If the drive firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.
- ___ 12. If you have more drive types to update, go back to step 5 on page 4-129 and update the next drive.

Updating drive firmware using an FMR tape:

Note: If using the FMR process order the FMR tape separately.

- ___ 1. Do not load it into the tape drive at this time, but have it ready to load later in this procedure.
- ___ 2. Make sure that the host application is not using the library or tape drive.
- ___ 3. Make sure that no tape cartridges are in the drives and that the top slot of the I/O Station is empty.
- ___ 4. To install the new firmware image using the FMR tape, select **Command > Drives > Firmware Update**.
- ___ 5. Open the I/O station.
- ___ 6. Place the FMR tape into the top slot of the I/O station.
- ___ 7. Close the I/O station. The library executes the TEACH and INVENTORY procedures.
- ___ 8. Select **OK**. The Select Drives Dialog displays.
- ___ 9. Use **Select** to select one or more drives to be updated.
- ___ 10. When your drive selection is complete, select OK. The Firmware-Update Dialog displays.

The picker takes the FMR tape out of the I/O station and places it into the selected drive or drives. The drive updates the firmware and unloads the FMR tape. The picker removes the FMR tape from the drive and returns it to the I/O station.
- ___ 11. Remove the FMR tape and store it for later use, such as to update code on a new or replacement tape drive.
- ___ 12. Verify that the firmware update completed successfully by checking the drive firmware version as described in “Determining current level of drive firmware” on page 4-117.
 - If the drive firmware version is the level recorded in Table 4-1 on page 4-117, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.
 - If the drive firmware version is still lower than the level recorded in Table 4-1 on page 4-117, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 7. Update SAN Data Gateway firmware

Detailed instructions for updating the SAN Data Gateway firmware are listed in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*. The sections below include basic information on determining the current level of firmware on your SAN Data Gateway Module and updating that firmware, if necessary.

Determining the level of firmware on the SAN Data Gateway Module

If the library has a SAN Data Gateway installed, it is highly recommended to install the software for the IBM StorWatch SAN Data Gateway Specialist to minimally monitor the SAN Data Gateway operation and for firmware update purposes. The software, which includes server and client software components, is located on the same website as the SAN Data Gateway firmware (<http://www.ibm.com/storage/1to>).

The server and client software can be located on the same PC or laptop and is easily started via access to the Programs folder on the desktop. By using the StorWatch Specialist, connectivity to the drives and library are graphically displayed thus helping to diagnose problems. The menu bar provides many diagnostics and functions as well as providing the capability to update SAN Data Gateway firmware. Details of operation are located in Chapter 3 of the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*. Installation information is located in Chapter 2.

Appendices A and B of the same document describes in detail how to access and test the SAN Data Gateway via the serial service port using a null modem serial cable. the particular HyperTerminal connectivity parameters are listed together with the Command Reference and descriptions.

To update the SAN Data Gateway firmware, complete the following steps:

- __ 1. Start the StorWatch Specialist server application if not already started.
- __ 2. Start the StorWatch Specialist client application if not already started.

Note: For information about starting the StorWatch Specialist server and client for Solaris, AIX, and other platforms, refer to the following web site at: <http://www.ibm.com/storage/1to>.

- To start the server using Windows NT
 - __ a. Click Start.
 - __ b. Click Programs —> StorWatch Specialist —> Server.
 - To start the server using Windows 2000
 - __ a. Click Start.
 - __ b. Click Programs —> StorWatch Specialist —> Client.
- __ 3. Connect the server (this is automatically done if the server and client are started and run on the same system).
 - __ 4. Log on to the server.
 - __ 5. To log on, type "Admin" in the Enter User Name field and type "password" (or the current password) in the Enter Password field, then click OK. Refer to Figure 4-209 on page 4-132 and Figure 4-210 on page 4-132.

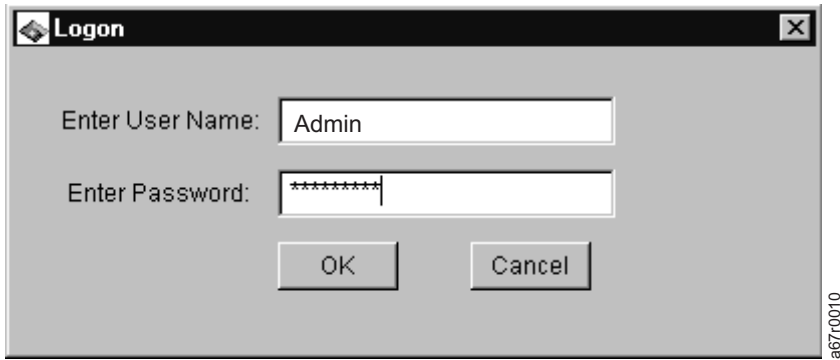


Figure 4-209. Logging on to the Server

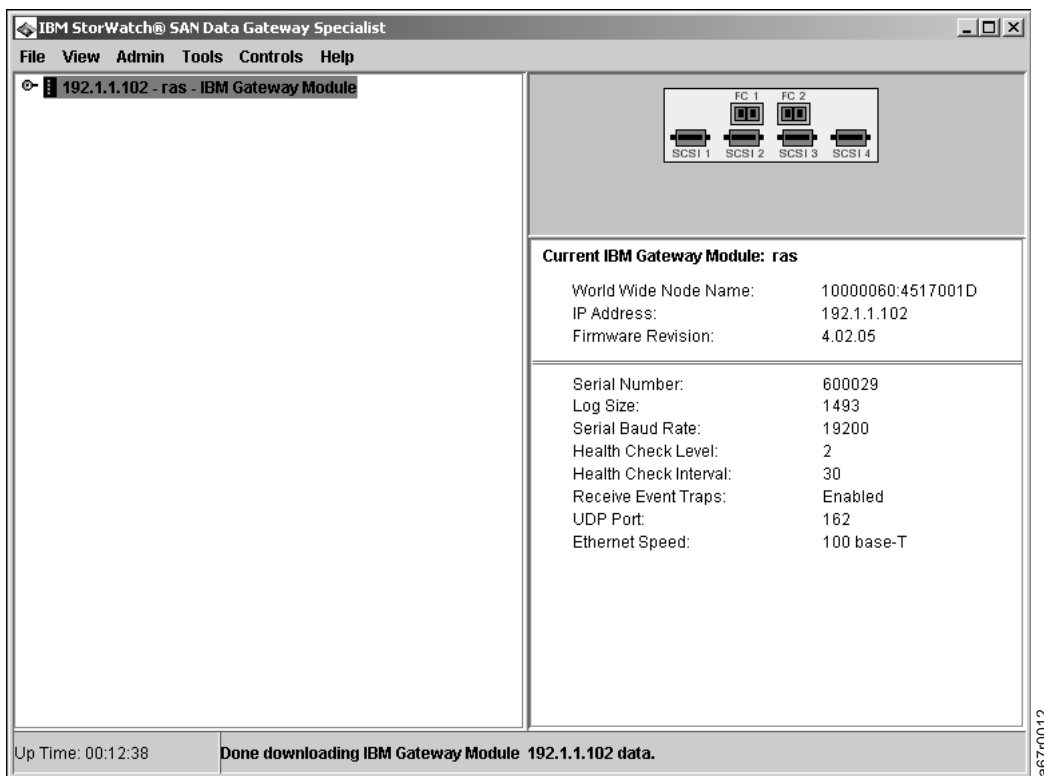


Figure 4-210. Initial Tree View

Note: Ensure the IBM Gateway Module is highlighted.

Updating SAN Data Gateway firmware

- __ 1. Click on Controls pull down menu.
- __ 2. Click on the Update Firmware selection.
- __ 3. Locate the SAN Data Gateway code that was downloaded from <http://www.ibm.com/storage/1to>. Refer to Figure 4-211



Figure 4-211. Controls Menu

Retrieving Inquiry Data

Two methods are available for retrieving the SCSI inquiry identification of the tape library:

Host utility

To retrieve SCSI inquiry data by using your server and a utility such as TAPEUTIL or NTUTIL, refer to the documentation for your server.

RMU To retrieve inquiry data using the RMU, open an web browser and type the IP address or hostname of the RMU. The TotalStorage Specialist Status page displays. The SCSI inquiry data of the library is shown in the upper right corner of the web page (for example, Name: RMU (IBM ULT3583-TL)).

Cleaning Drives

Whenever a drive requires cleaning, it alerts you with a message on the library operator panel or host console. The library uses the IBM TotalStorage Cleaning Cartridge or the IBM LTO Ultrium Cleaning Cartridge to clean the drive with whatever cleaning method that you choose. In all methods, cleaning is performed after the data cartridge has been unloaded from the drive and before the next load. All cleaning cartridges that are processed by the library must bear a bar code label.

Note: The volume serial number (VOLSER) on the cartridge's bar code label must begin with **CLN**, or the library treats the cleaning cartridge as a data cartridge during an inventory.

Three methods of cleaning the Ultrium Tape Drive are available:

Automatic cleaning

Automatic cleaning enables the Ultrium Scalable Tape Library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process. Automatic cleaning makes the cleaning process transparent to any host application that uses the library. You can enable or disable automatic cleaning by using the library's operator panel. The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. The cleaning cartridge must be located in a nonaddressable storage slot.

Host cleaning

Host/Application maintained and activated is the default condition. Host cleaning enables the server to detect the need to clean an Ultrium Tape Drive and to control the cleaning process. The cleaning cartridge must be stored in one of the available storage slots within the library. For more information, see the section about cleaning in your application software documentation.

Manual cleaning

Manual cleaning requires that you use the Move Media command from the library's operator panel to insert a cleaning cartridge into the library to perform cleaning on one or more of the Ultrium Tape Drives (see "Moving a Cartridge" on page 4-38).

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

Cleaning the drive on a periodic basis is not recommended. Only clean the drive when the cleaning symbol displays in the drive status area of the operator panel.

Chapter 5. Start

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Overview

All service actions should begin with the START Section (this section). This chapter provides procedures and pointers to other sections of this book to be used by the Field Engineer for all service actions.

Maintenance Starting Point

Library Service Approach

If you are here because of a suspected problem with the Storage Area Network (SAN) Data Gateway Module go to *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* to complete this service action.

Note: Some problems may be difficult to isolate between the gateway module and library SCSI host interface board. This is especially true for SCSI bus problems. The following procedure is an aid in determining which FRU is at fault.

1. See the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* introduction chapter, LED indicators to verify the LEDs on the gateway are in the correct state. If LED indicators are in the correct state then proceed with step 2. If LED indicators are not in correct state proceed with MAP section of *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.
2. If a particular SCSI port or target devices on a particular SCSI port are not functioning do the following:
 - a. Go to the SCSI MAP in MAP section of *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* and proceed as directed. If you do not find a problem return here to step 2b.
 - b. Proceed with the Start section here. The 3583 library diagnostics contain a SCSI wrap test for the tape drives only. The library SCSI host interface board is not tested.

Begin all other service actions here. Start at the top of each table. Locate the reason you are here in the left column and perform the action in the right column.

Maintenance Hints:

1. If a problem is fixed by replugging of a cable or card, enter a specific comment in the field tracking system.
2. If the problem is intermittent and will not fail, replacement of the FRU Group may be appropriate. Based on the severity of the problem and customer input, determine the correct action to take.

Recommended maintenance procedure steps:

1. **Use** Table 5-1 on page 5-3 to determine the service action to perform. The symptoms and actions are listed in order of priority.
2. **Follow** the recommended service procedure until a list of possible FRUs is recommended for the problem.
3. **Review** the FRU list, **ensure** that all associated Boards and cables are properly seated, and **inspect** mechanical assemblies for obvious damage before ordering or replacing FRUs.
4. **Replace** recommended FRUs in the order specified. If a FRU does not correct the problem, reinsert the original FRU and return the new FRU to stock.
5. **Verify** that the library is functioning correctly. For library firmware levels greater than 5.22 select **More->Service->Library->Exercise->Verify Test**.
6. **Return** the library to customer use.

Start Service

Use the following table to start your service call.

Table 5-1. Start Service

If ...	Perform this Action
<p>A dc power indicator is NOT on. The indicator for the power supply is located on the dc power supply assembly 2 (see Figure 7-17 on page 7-18). Check power before proceeding with any library maintenance (refer to “Power Supplies Check Procedure” on page 8-53).</p>	<p>Go to procedure “Analyze Tape Library Power Problems” on page 5-6.</p>
<p>Library subsystem power problem - (includes library and tape drives).</p>	<p>Go to procedure “Analyze Tape Library Power Problems” on page 5-6.</p>
<p>Drives do not respond to commands from a SCSI host.</p>	<ol style="list-style-type: none"> 1. Ensure the SCSI IDs of the drives are set properly. 2. Ensure the SCSI bus is properly terminated and the correct terminator is being used. Also, ensure that the SCSI Wrap Plug (diagnostic tool) is not inadvertently being used as a terminator. 3. Verify that the SCSI cable is securely and properly attached to the drive and also at all points back to the Host adapter card. Also, check each cable connector for bent pins. 4. Go to “Main Controller Board” on page 8-34 to replace the main controller board.
<p>If Library contains a SAN Data Gateway, Drives or Library not responding to commands from a Fibre Channel host.</p>	<ol style="list-style-type: none"> 1. Ensure the SCSI bus is properly terminated and the correct terminator is being used. Also, ensure that the SCSI Wrap Plug (diagnostic tool) is not inadvertently being used as a terminator. Also, check terminator and SCSI cable connectors for proper secure attachment and for bent pins. 2. Ensure that the library LUN addresses are properly mapped to what the Host expects. Sometimes re-cabling the SCSI ports and drives will alter the LUN mapping at the library thus causing the Host not to be addressed properly. 3. Go to the <i>IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide</i> to identify problems in the gateway configuration or hardware. 4. Check cable connections on the Main Controller Board and the Host Interface Board connector to the Main Controller Board. Ensure that the cable retention clips are present on the Main Controller Board and that the holding tabs are not broken. See “Reseating Cables” on page 9-27. (Retention clips replacement FRU, P/N 19P5362) 5. Go to “Main Controller Board” on page 8-34 to replace the main controller board.
<p>The Library firmware does not complete the boot-up process and appears hung. Failure of the main menu to appear on the Operator panel after one minute indicates that the boot-up process is not completing.</p>	<ol style="list-style-type: none"> 1. Power off the library and wait at least one minute before power on to recover the problem. 2. If a library firmware update was just performed, try to repeat the update procedure. 3. Check cable connections on the Main Controller Board. Ensure that the cable retention clips are present on the Main Controller Board and that the holding tabs are not broken. See “Reseating Cables” on page 9-27. (Retention clips replacement FRU, P/N 19P5362) 4. Go to procedure “Main Controller Board” on page 8-34 to replace the main controller board.

Table 5-1. Start Service (continued)

If ...	Perform this Action
<p>Picker Home Failure message on the Operator panel.</p>	<ol style="list-style-type: none"> 1. Power off the library: <ul style="list-style-type: none"> • Open the front door and ensure all cartridges are fully seated in their slots or that no other obstruction, such as a cartridge partially protruding out of the picker fingers, is preventing the picker from reaching home properly. • Ensure that the front door and the door of the I/O station are securely closed. • Power on the library to recover from the problem. 2. Check cable connections on the Main Controller Board and the Picker Control Board. Ensure that the cable retention clips are present on both boards and that the holding tabs are not broken. See "Reseating Cables" on page 9-27. (Retention clips replacement FRU, P/N 19P5362) 3. Go to "Picker Assembly" on page 8-7 to replace the picker assembly. 4. Go to "Picker Control Board" on page 8-16 to replace the board.
<p>3583 firmware (Library, Drive, RMU, and SAN Data Gateway Firmware is not at the latest level.)</p>	<p>Go to "Updating Firmware" on page 4-114 for instructions on updating all of the components which are not at the latest level. The procedure will direct you to the IBM web site to check for latest firmware levels.</p>
<p>Service Action Code (SAC) message from the Operator panel or from the Host.</p>	<ol style="list-style-type: none"> 1. Prepare library for service. 2. If the SAC is unknown, run the Start option from the Operator Panel to retrieve the SAC (Main Menu-> Service-> Start). 3. Using the SAC, start at Table 6-1 on page 6-4 locate the SAC and perform the actions in the order recommended.
<p>Excessive retries on one section of magazine or the cartridges are not fully inserted in the storage slots.</p>	<ol style="list-style-type: none"> 1. Prepare library for service. 2. For libraries prior to serial number 13-17562, ensure columns 4 & 5 have the magazine bay "shims" installed (EC H80532, shim kit P/N: 18P8886). 3. Ensure that the magazines in all of the magazine positions in the library are Revision "B". See back of magazine for revision number. 4. Run Get/Put diagnostic from the Operator panel (Main Menu —>Service —>Library —>Diags —>Fingers —>Get/Put) to verify excessive retries. The gripper should get and put cartridge cleanly into storage slot. If gripper bumps into an upper or lower cartridge during this operation, retries are considered excessive. Note the storage slot where this happens then replace the storage magazine.

Table 5-1. Start Service (continued)

If ...	Perform this Action
<p>Customer reported that not all cartridges are being seen by the library</p>	<ol style="list-style-type: none"> 1. Prepare library for service. 2. Clean the Bar Code Reader's lens. See "Cleaning the Bar Code Reader Lens" on page 9-30. 3. Check that the cartridge labels are correctly applied and that they are supported labels. See the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i> 4. After performing the above two steps, verification of the bar code reader function can be performed on a particular cartridge in question or on any cartridge in a slot within the library. Perform the following two functions to perform a bar code reader scan of a cartridge label: <ul style="list-style-type: none"> • Move the picker in front of the cartridge slot which is to be read: Main Menu-> Command-> Move-> Position Picker • Scan the cartridge label in this slot: Main Menu-> More-> Service-> Library-> Diags-> Fingers-> Scanner->Scan <p>Compare the just scanned cartridge to the actual label.</p> 5. Perform the serial port INV command three times to verify that the bar code reader always reads correctly each cartridge label every pass. See "Performing a Library Inventory" on page 9-30.. 6. Replace the Picker Assembly (see "Picker Assembly" on page 8-7). 7. Replace the Picker Control PCBA (see "Replacing the Picker Control Board" on page 8-16).
<p>RMU Problem</p>	<ol style="list-style-type: none"> 1. Verify RMU firmware is at the latest level (go to "Updating Firmware" on page 4-114). 2. Go to "Analyze RMU Problems" on page 5-7.
<p>Library Problem - No Error Message (includes visual symptoms or noise from the picker)</p>	<ol style="list-style-type: none"> 1. Prepare library for service. 2. Go to procedure "Other Library Failures" on page 5-8 to analyze the problem.
<p>Drive sense data from host error logs is collected</p>	<p>Go to procedure Chapter 11, "Sense," on page 11-1.</p>
<p>A drive or library tape alert, drive error code, or other SCSI or Fibre Channel connectivity errors reported to the server was collected, or if media type problems are occurring.</p>	<p>Go to "TapeAlert Flags" on page A-1 for actions to be taken. Also, this appendix contains several suggested procedures and diagnostics which can be used to either correct the problem or help to isolate the failing area of the library.</p>
<p>Install the Tape Library</p>	<p>Go to Chapter 14, "Installation," on page 14-1 to verify proper installation of the library and any components.</p>
<p>Retrieving Error log, Trace Data and Command Log</p>	<p>Go to procedure "Methods of Capturing Logs" on page 9-2. Note: Please have these logs "captured" prior to calling the Support Center.</p>

Analyze Tape Library Power Problems

Make sure the ac Power Cord is plugged in and the dc Power Modules are installed properly. Power Up the Library, observe the Library Operator Panel Display and the dc Power Modules' LEDs before proceeding.

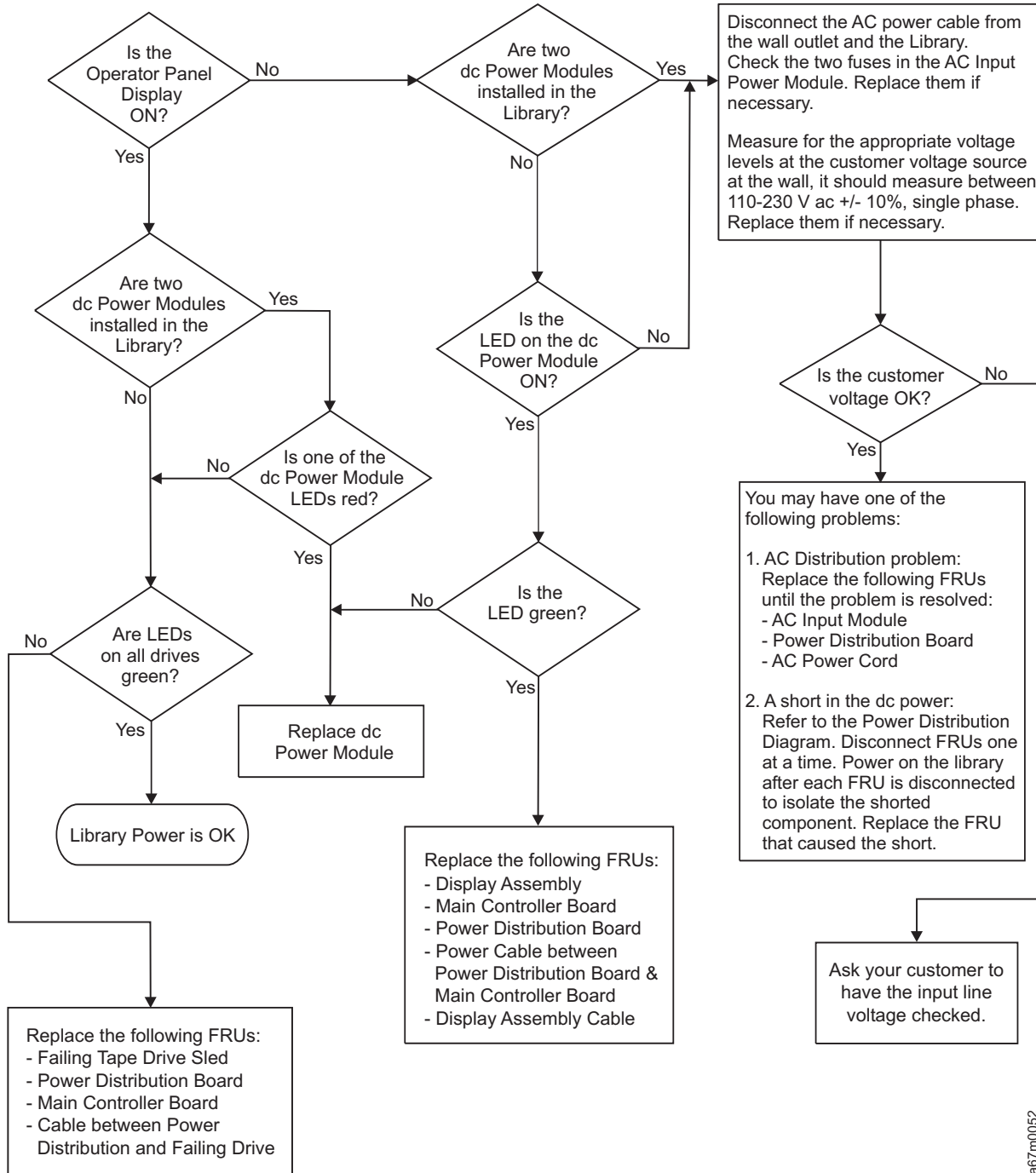


Figure 5-1. Power Map

Analyze RMU Problems

Use Figure 5-2 to help resolve these problems with the RMU:

- SAC A0 00
- Failure to start an Ethernet session from attached PC
- Unexpected LED activity

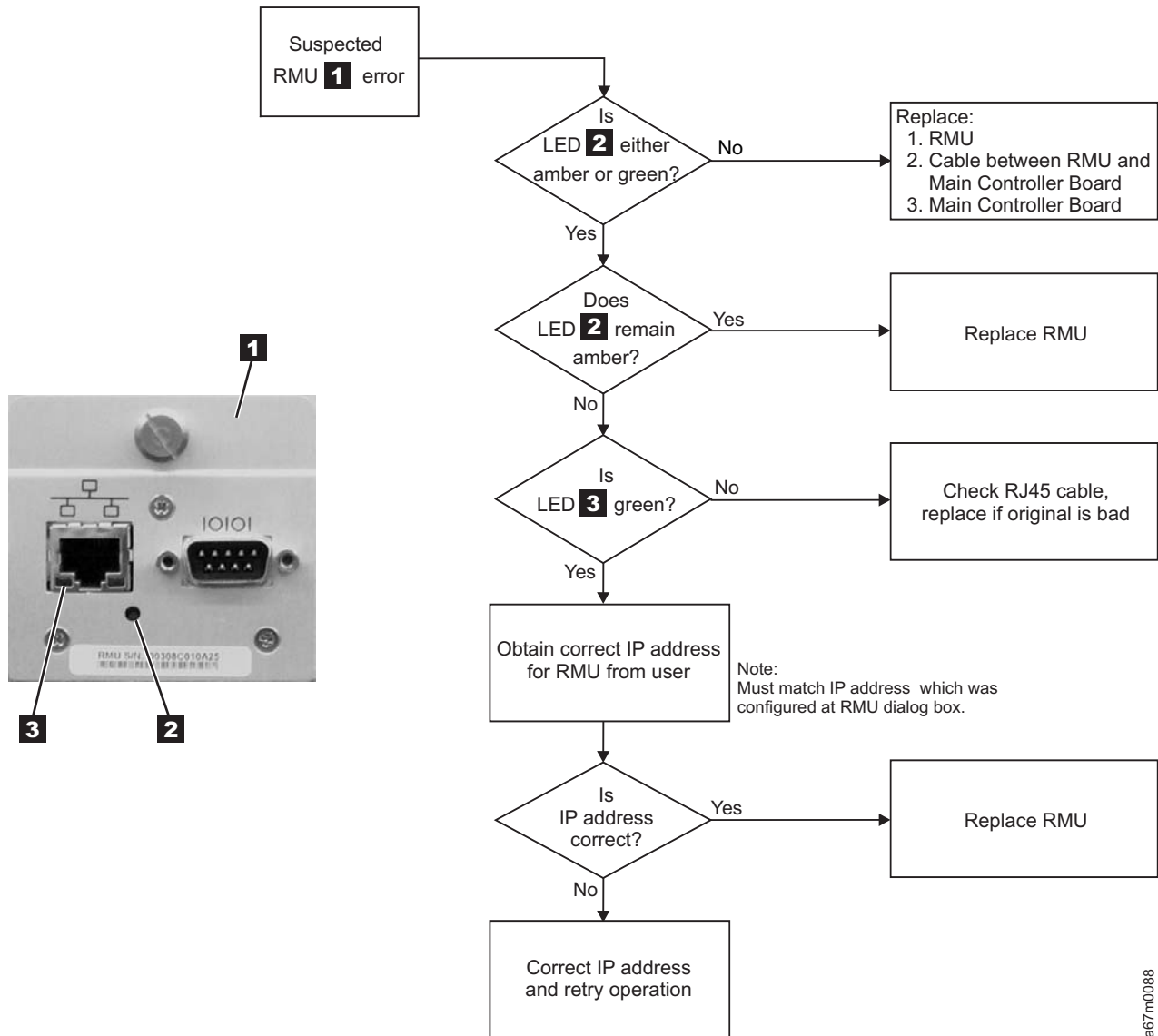


Figure 5-2. RMU Map

Note: If the RMU is directly attached to the PC (PC and RMU only), a special RJ45 ethernet crossover cable must be used. Otherwise, if the RMU is part of a network hub, a normal straight-through RJ45 ethernet cable must be used.

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Other Library Failures

Use the following table to perform problem analysis for Library failures that appear as Visual, Audible, or other Symptoms without Service Action Codes (SACs).

Table 5-2. Problem Analysis for Failures without Service Action Codes

Symptom	Possible Causes	Actions or FRUs	Reference Information on Page
Bearing noise or squeak from Y-axis	Defective bearing	Replace: casting supporting picker assembly Y-axis belt picker assembly Y-axis motor	8-7 8-18 8-7 8-29
Binding Y-axis	Defective bearing	Replace: casting supporting picker assembly Y-axis belt picker assembly Y-axis motor	8-7 8-18 8-7 8-29
Rotary axis vibration (oscillation) when stopping or stopped	Servo problem	Replace: picker control board rotary axis motor	8-16 8-14
Fuse or fuses blown on ac input module.	Shorted component or heavy load on circuit	Replace the fuse and power-on the library. If the fuse continues to blow, examine the power diagrams and isolate the failing component by unplugging cables in the fuse circuit until the failing FRU is determined.	12-4 12-5
I/O station problem	I/O station mechanical or electronic failure	Replace: I/O station assembly display assembly main controller board	8-50 8-47 8-34
Operator panel display incorrect operation	Operator panel electronic failure	Replace: display assembly main controller board Operator panel cable	8-47 8-34
Operator panel switches incorrect operation	Operator panel electronic failure	Replace: display assembly main controller board Operator panel cable	8-47 8-34
Operator panel No indicators are working	+5 V dc voltage missing from Operator panel	Replace: dc power supply assembly main controller board display assembly display assembly cable	8-54 8-34 8-25

Chapter 6. Fault Symptom Index

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Overview

The following are definitions for acronyms and the acronyms used in this chapter:

1. Remote Management Unit will be referred to as RMU.
2. Service Action Code will be referred to as SAC.
3. Power-On-Self-Test will be referred to as POST.

When a failure occurs, the Tape Library firmware performs error recovery and error reporting. If the failure requires a service call, a two-byte SAC is generated and presented on the Operator/CE panel. This SAC is the result of the Tape Library firmware analyzing all pertinent information available at the time of failure which include sense data, the operation in progress, error and threshold data and any data returned from diagnostic routines invoked by the firmware to isolate the failure.

Prior to performing the suggested actions for each SAC, it is recommended that you retrieve the Command and Error logs in case you need further assistance from Product Support to resolve the problem. To retrieve logs, see “Methods of Capturing Logs” on page 9-2

Service Action Codes

Table 6-1 on page 6-4 lists the SACs, the error description and the actions that can be performed in addition to the FRUs that can be replaced. Each SAC consists of two bytes “nn xx”:

- “nn”: SAC.
- “xx”: SAC modifier. This byte identifies the processor that reports the error:
 - “00” = Main Controller
 - “10” = Picker Controller
 - “20” = Display Controller
 - “3x” = Drive Sled Controller (“x” = Drive ID (1 to 6)).
 - “40” = Host Interface Controller (SCSI)
 - “50” = RMU Controller

Note: For most SACs, the modifier is extra information, thus the value is not important; however, a small number of SACs will use this modifier to further refine the actions to be performed. The SACs requiring the modifier value are documented so that the suggested actions are grouped depending on the value of the modifier.

The table also lists the FRU names and a reference column which points to the page containing the location of the FRU or the procedure on how to perform the suggested action.

Actions associated with each SAC are listed in their order of probability. Always perform the actions in the order listed, starting with the top action and continue down the list until the problem is resolved.

Press the button below the **Main Menu (initial screen)** → **Status** → **Logs** → **Error Log** softkeys. The Error Log Dialog displays (see Figure 6-1).

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

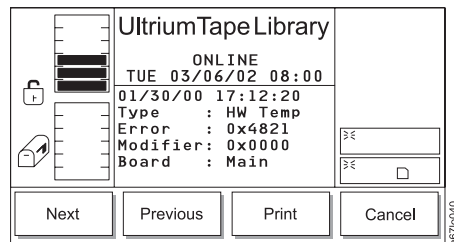


Figure 6-1. Error Log Dialog

Note: When an action calls for observation of the library Robotics you must remove library top cover, see “Observing Library Robotics” on page 9-29.

Table 6-1. Service Action Codes

SAC	Type of Error	Perform these actions	See Page
01 xx	Type 1 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
02 xx	Type 2 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
03 xx	Type 3 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
04 xx	Type 4 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
05 xx	Permanent operating system error	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
		Contact next level of support.	
10 xx	Bar code reader communications failed.	Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	7-8
		Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
		Replace picker assembly.	8-7
		Replace picker control board.	8-16
11 xx	Bar code reader communication is OK, Data received from bar code reader is bad.	Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	7-8
		Replace picker assembly.	8-7
		Replace picker control board.	8-16
12 00	Bar code reader communication is OK, bar code reader reports data is bad.	Replace picker assembly.	8-7
13 xx	Cannot read bar code label or label is bad.	Check Cartridge labels to ensure that they meet specifications and installed properly and not damaged or dirty, the slots in question are displayed with the SAC.	
		Ensure that scan beam is not obstructed.	
		Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	7-8
		Power off and on the tape library to recover from the error. Use the main power switch to perform this action, wait at least one minute between power off and on.	
		Replace picker assembly.	8-7

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
14 xx	The system detects Serial Number is missing from its NVRAM.	Record and reenter System Serial Number (Using serial cable and HyperTerminal, enter "setser" command from HyperTerminal prompt.	8-34
15 XX	An intermittent scanning error was detected. During Demo, the library performs inventory after each complete demo cycle and detects a mismatch between the number of cartridges scanned and its previous database.	Note the number of cartridges installed in the library and use the operator panel to compare this information with the number of cartridges reported by the library. Examine the cartridges that are installed but not reported by the library for proper cartridge labels and replace labels if necessary. Note that if a whole column of cartridges is missing, the column fiducial label can be defective. In this case, the whole storage column must be replaced. If all labels are correct, clear the SAC and retry the Demo program.	8-32
		If the problem remains, replace the Picker Assembly.	8-7
20 00	Serial port connection failures.	Replace main controller board.	8-34
		Replace the host interface board (SCSI).	8-45
		Replace serial port cable between host system and host interface board (SCSI).	
		Problem is in host system.	
21 xx	NVRAM failures.	Check Library configuration and reenter all data (SCSI ID, Time/Date, Library Serial Number, and any other valid data).	
		Power off and on the tape library a few times to see if the same error condition reappears. Use the Main Switch to perform this action, wait at least one minute between power off and on. Note: If the error reappears after a number of power on/off cycles, replace library main controller board.	8-34
22 00	Fail to communicate with Operator panel.	Reseat cable between main controller and display assembly.	9-27
		Replace cable between main controller and display assembly.	8-47
		Replace main controller board.	8-34
		Replace display assembly.	8-47
23 00	An unexpected interrupt is received.	Replace main controller board.	8-34
		Replace picker control board.	8-16
30 00	A fatal error is detected in SCSI Port.	Verify the SCSI bus connection to Library is properly terminated and powered.	
		Verify that the Library SCSI is properly configured by using the Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace main controller board.	8-34
		Replace host interface board (SCSI).	8-45

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
31 00	A fatal error is detected in SCSI Port.	Verify SCSI bus connected to Library Port is properly terminated and powered.	
		Verify Library SCSI Port is properly configured by using Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace main controller board.	8-34
		Replace host interface board (SCSI).	8-45
32 00	Wrong SCSI bus connection detected. A single-ended SCSI bus is connected to Library set up in Differential mode.	Verify Host SCSI bus is same type as Library host interface board (SCSI).	
		Verify LVD-HVD switch is set correctly on Library host interface board (SCSI).	7-16
33 00	Wrong SCSI bus connection detected. A single-ended SCSI bus is connected to Library set up in Differential mode.	Verify Host SCSI bus is same type as Library host interface board (SCSI).	
		Verify LVD-HVD switch is set correctly on Library host interface board (SCSI).	8-45
34 00	A general SCSI failure is detected.	Verify that the SCSI host is working properly.	
35 00	A fatal SCSI error is detected.	Verify SCSI connected to Library is properly terminated and powered.	
		Verify Library SCSI is properly configured (if applicable) by using Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace Library main controller board.	8-34
		Replace the host interface board (SCSI).	8-45
38 xx	The RMU cannot communicate with the Dynamic Host Configuration Protocol (DHCP) server.	Ensure the network cable is properly connected to the RMU and verify that the RMU is set up to work in DHCP mode (Main Menu →Setup →Library →RMU).	
		Verify that the DHCP server is properly set up and configured. Test to see if the DHCP server can ping the RMU.	5-7
		Replace the RMU.	8-39
39 xx	An external network error was detected by the RMU	Ensure the network cable is properly connected to the RMU.	5-7
		Verify that the network the RMU is connected to is working properly.	5-7
		Replace the RMU.	8-39
40 xx	The Library detects that Servo power is missing.	Replace dc power supply.	8-54
		Replace power distribution board.	8-49

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
42 xx	An invalid library configuration was detected: The I/O station storage column is missing or drive modules are not installed in the allowable configurations.	Ensure all tape drive modules are properly installed (refer to the instructions in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i> . Drive sled 1 must be installed at the bottom slot of drive column. If you have a library with the Multi-Path feature, see the section about partitioning in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i> .	
		Ensure that the firmware level of all PCBAs installed in the library match.	
		Ensure I/O station column (column 1) is installed and fiducial label is properly installed. Ensure the fiducial label is not damaged. Fiducial label is present on both standard I/O and 12 slot I/O station.	
		Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		<p>Verify that the bar code reader is working properly:</p> <ul style="list-style-type: none"> • With the library offline, open the door, observe a cartridge to be tested. Write down the cartridge label number and column/slot location. Close the door. The library will immediately perform an inventory of all the cartridges in the library. • When the inventory has completed, at the Operator panel, press Command—>Move—>Move Media. When asked to Select Target, enter the cartridge column/slot location you wrote down earlier. The library should respond back with a message stating that the target address already has a cartridge in it. It will also display data such as: Target:xxx (representing the column/slot address) and the bar code label number of the cartridge in that slot address. <p>If bar code reader is working properly, the value of scanned bar code will be displayed on the Operator panel. If diagnostic failed, replace:</p> <ul style="list-style-type: none"> – Picker assembly – Picker Control PCBA 	8-7
43 xx	An unknown library configuration is detected, the bar code reader reads a fiducial label where none is expected.	Ensure that the firmware level in the tape library supports the hardware installed.	
		If you are unable to determine the defective part, perform a serial trace (see “Capturing Serial Logs” on page 9-4).	9-4
		Check for a dirty, damaged, missing or wrong fiducial label located on storage columns, magazines, or tape drive sleds in the library, and replace the part that is defective.	

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
44 xx	An unknown fiducial label is detected during a teach operation.	Ensure that the firmware level in the tape library supports the hardware installed.	
		If you are unable to determine the defective part, perform a serial trace (see “Capturing Serial Logs” on page 9-4).	9-4
		Check for a dirty, damaged, missing or wrong fiducial label located on storage columns, magazines, or tape drive sleds in the library, and replace the part that is defective.	
46 xx	A failure was detected during the scanning of fiducial or cartridge labels. This failure can be caused by a number of things. Perform the following actions to recover from the failure.	This error can be caused by a dirty bar code reader (dust or fingerprints). Clean the bar code reader window with a lint free cloth and retry the operation.	7-8
		This error can be caused by a dirty, damaged or missing fiducial label on the magazine. To isolate the problem magazine, perform one of the following procedures: <ul style="list-style-type: none"> Note the number of magazines installed in the library (each magazine should have at least one cartridge in it) and use the Operator panel to compare this information with the number of magazines reported by the library. If the library is equipped with a 12 slot I/O station, the icons representing the magazines in the I/O station column are displayed in the I/O station area. Remove one magazine at a time and retry the operation until the problem is resolved (Main Menu →Status →Library →System or Slot). Replace the failing magazine if found. 	
		This error can be caused by a dirty, damaged or incorrect cartridge bar code label. To isolate the problem cartridge, try one of the following procedures: <ul style="list-style-type: none"> Note the number of cartridges installed in the library and use the Operator panel to compare this information with the number of cartridges reported by the library. Remove a few cartridges at a time and retry the operation until the problem is resolved (Main Menu →Status →Library →System or Slot). Replace the bar code label on the cartridge. 	
		This error can also be caused by hardware failures: <ul style="list-style-type: none"> Ensure the picker assembly flex cable connector is properly seated on the picker control board. Inspect the picker flex cable for any obvious damage. Rotate the picker assembly to maximum counter clockwise (grip fingers facing the drive column) and inspect the area of the cable loop that is near the rotary motor encoder. If the Picker flex cable does not contain enough slack in this loop, the encoder on the Rotary axis motor can rub on the cable and cause damage. If the picker flex cable is damaged, replace the picker assembly. 	9-27 8-7

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
50 00	A cartridge is not properly seated in the storage slot.	Ensure the cartridge in question is properly installed in its storage slot. Slots are displayed with the SAC. Run start option from Operator panel to retrieve this information (Main Menu →More →Service →Start).	
		Ensure Cartridge label meets specifications, is installed properly and not damaged or dirty.	
		Reteach library using Operator panel (Main Menu →More →Service →Library →Teach).	
60 xx	Cannot complete lock/unlock I/O station commands.	Open the library front door to check for any mechanical binding by manually moving plastic lever attached to gear of motor on the I/O station assembly.	
		Run lock diagnostics from the Operator panel to see if there is any mechanical bindings (Main Menu →More →Service →Library →Diags →Sensors).	
		Replace the I/O station assembly	8-50
		Replace display assembly.	8-47
61 00	The I/O station closed sensor error threshold is exceeded.	Replace I/O station assembly.	8-50
70 xx	Failures detected in picker assembly grip finger open operation.	Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		Run Grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> • If diagnostic failed: replace the picker assembly. • If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and if appropriate replace the picker assembly. 	8-7
		Replace picker control board.	8-16
71 xx	Failures detected in picker assembly grip finger close operation.	Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		Run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> • If diagnostic failed: replace the picker assembly. • If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and if appropriate replace the picker assembly. 	8-7
		Replace picker control board.	8-16

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
72 xx	Get command was issued but sensor indicated a cartridge is already present in picker assembly.	<p>Look into picker assembly to see if a cartridge is present.</p> <p>If a cartridge is found:</p> <ul style="list-style-type: none"> Recover the cartridge, place it in any empty slot, close the door and retry failing operation. Perform actions in SAC "02 00". <p>If a cartridge is not found in the picker assembly:</p> <p>Perform the actions in SAC "73 xx".</p>	
73 xx	Failures detected in picker assembly finger open/close operations.	Ensure that the firmware level is at 5.22 or higher.	
		Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		Run Grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close):	8-7
		<ul style="list-style-type: none"> If diagnostic failed: replace picker assembly. If diagnostic passed, retry it several times. If it fails during successive retries or if intermittent failures continue to occur during normal operations, replace the picker assembly. 	
		Check cartridge for physical damage.	
Check for a stuck cartridge in a tape drive or storage slot. Replace the tape drive or magazine. Close the door and retry the failed operation.	8-4		
Replace picker control PCBA.	8-16		
74 00	Get command was issued but the sensor indicated source location is empty.	Error can be caused by a cartridge not fully inserted in storage slot above failing slot. Check to see if this condition exists, if so, push the cartridge into its slot. Reinventor the Library (Main Menu →Commands →Inventory).	
		Error may be caused by picker not getting to its intended target due to a defective Y-Axis belt. Locate the picker and compare its coordinates with the failing slot's coordinates posted with this SAC. Adjust or replace the Y-Axis belt if they do not match.	8-18
		<p>Look into location (slot or drive) and see if a cartridge is present.</p> <p>If a cartridge is found:</p> <p style="padding-left: 40px;">Perform the actions in SAC "73 xx".</p> <p>If a cartridge is not found in this location:</p> <p style="padding-left: 40px;">Perform the actions in SAC "02 xx".</p>	
75 00	A failure is detected in the picker assembly.	Replace picker assembly.	8-7
		Replace picker control board	8-16
76 00	A teach failure is caused by the picker assembly out of alignment condition.	Make sure Y-axis drive belt is properly installed and tensioned.	Step 18 on page 8-22

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
77 xx	Failures detected in the picker assembly during a reach axis retract operation.	Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		Check for failure to retrieve a cartridge from a magazine. Replace the magazine, close the door, and retry the failed operation.	
		Check the cartridge for physical damage.	
		Replace picker assembly.	8-7
		This failure can be the result of the drive not ejecting the cartridge properly so that the picker can retrieve it. Check the drive for proper cartridge ejection (the cartridge must be easily retrieved without any force); replace the drive if necessary.	8-4
		Replace picker control PCBA.	8-16
78 xx	A put command was issued but sensor indicated the cartridge is not present in picker assembly.	Look into the picker assembly and see if a cartridge is present. If a cartridge is found: Perform the actions in SAC "73 xx". If a cartridge is not found in the picker assembly: Perform the actions in SAC "02 xx".	
79 xx	Failures detected in putting a cartridge into a tape drive.	Check the tape drive to ensure it's properly seated, powered on and working properly.	
		Replace picker assembly.	8-7
		Replace picker control board.	8-16
7A xx	Failures detected in picker assembly during a reach axis retract (to home position) operation.	Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	9-27
		Check for the failure to retrieve a cartridge from a magazine. Verify that all magazines in the library are stamped on the back with REVB . Replace all magazines that are not REVB , close the door, and retry the failed operation.	
		Check the cartridge for physical damage.	
		Replace picker assembly.	8-7
		This failure can be the result of the drive not ejecting the cartridge properly so that the picker can retrieve it. Check the drive for proper cartridge ejection (the cartridge must be easily retrieved without any force); replace the drive if necessary.	8-4
		Replace picker control PCBA.	8-16

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
7C xx	Failures detected in picker assembly during a reach axis extend operation.	Check for obstruction in the slot. Obstruction can be: <ul style="list-style-type: none"> • An unlabeled cartridge of a bad label • A cartridge in the slot during a put operation • The slot wall in the magazine is too tight • A tape drive failure that prevents the cartridge from being inserted properly Remove obstruction or replace the magazine or drive, close door and retry the failing operation.	
		Perform the actions in SAC "7A xx".	
7D xx	Failure detected while getting a cartridge from a tape drive.	Check the Tape drive to see if a cartridge is present. If a cartridge is found in the tape drive: Remove cartridge from the tape drive, power drive off then on and retry the operation. If a cartridge is not found in the tape drive: Perform actions in SAC "02 xx".	
7E xx	Failure detected while pushing a cartridge into a tape drive feed slot.	Check the cartridge for any physical damage.	
		Replace the failing tape drive sled.	8-4
80 xx	Failures detected in the rotary-axis servo system.	Inspect gearing between the rotary axis motor and picker assembly. Replace following FRUs in the order shown:	
		Replace rotary axis motor.	8-14
		Replace picker assembly.	8-7
		Replace picker control board.	8-16
81 xx	Failures detected in the Y-axis servo system (can be the result of SAC 7A XX).	Check Y-axis for any binds by moving it up and down. The binding can be between picker assembly and Y-shaft. If any binds exist, replace appropriate FRU.	
		Replace Y-axis motor assembly.	8-29
		Replace power distribution board.	8-49
		Replace Y-axis drive belt.	8-18
82 xx	An unexpected motion control condition was received.	If the SAC modifier "xx" is: 00 - Replace power distribution board. 10 - Replace picker control board and picker assembly.	8-49 8-16 8-7
		Replace signal cable between main controller board and power distribution board.	8-27
		Replace power cable between main controller board and power distribution board.	8-27
83 xx	Locate fiducial command failed with no target found. This failure is most likely to occur during initial installation of library subsystem.	Ensure all fiducial labels are present and within specification.	
		Clean all teach fiducial labels.	

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
84 xx	Y-axis failed to reach target.	Check for mechanical binding in Y-axis.	8-29
		Replace Y-axis motor.	8-29
		Replace Y-axis drive belt.	8-18
		Replace power distribution board.	8-49
		Replace the Y-shaft (if obvious damage).	8-30
		Replace Y-axis flex cable.	8-24
85 xx	Rotary axis failed to reach target.	Check for mechanical binding in rotary axis.	8-14
		Replace rotary axis motor.	8-14
		Replace picker assembly.	8-7
		Replace picker control board.	8-16
86 00	The first full speed move command issued when picker is at home position failed.	Check for mechanical binding in both rotary and Y-axis.	
		Press power switch to the O position and wait one minute. Now press the power switch to the I position and observe the picker assembly to see which axis (rotary or Y) fails to move: If the rotary -axis fails to move: Perform the actions in SAC “80”.	
		If the Y-axis fails to move: Perform the actions in SAC “81”.	
		If both axes fail to move: Replace the main controller board. 8-34 Replace the picker control board. 8-16 Replace the power distribution board. 8-49 Replace Y-axis flex cable. 8-24	
87 00	Picker assembly cannot move away from rotary axis home position.	Replace rotary axis motor.	8-14
		Replace picker control board.	8-16
		Replace picker assembly.	8-7
88 00	Picker assembly cannot move away from Y-axis home position.	Replace Y-axis motor.	8-29
		Replace power distribution board.	8-49
		Check the belt for proper tension, replace the Y-belt if broken or worn.	8-18
		Check Y-axis for any binds by moving it up and down. Binding can be between picker assembly and the Y-shaft. If any binds exist, replace appropriate FRU.	8-29
89 xx	Failure was detected while communicating with the motion controllers. Note: Verify that the Picker Assembly with the latest ESD changes (DATE CODE of 05/12/03 or later) is installed.	If the SAC modifier “xx” is: 00 - Replace power distribution board. 8-49 10 - Replace the picker control board and the picker assembly. 8-16 8-7	
		Replace signal cable between main controller board and power distribution board.	8-27
		Replace power cable between main controller board and power distribution board.	8-27

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
8A xx	The returned sense indicated that a motion command completed sooner than expected.	If "xx" = "00" - Check the Y-axis for any bindings, binding can be caused by an object (like a cartridge) that prevents the Y-axis from homing and reaching its target correctly. If a bind is found, remove the bind and retry the operation. If a bind is not found, replace the Y-axis motor assembly.	8-29
		If "xx" = "10" - Check rotary axis for any bindings, binding can be caused by an object (like a cartridge) that prevents the rotary axis from homing and reaching its target correctly: If a bind is found, remove the bind and retry the operation. If a bind is not found, replace the rotary axis motor, then picker assembly.	8-14 8-7
8B xx	Servo failures detected but the axis is not known.	Replace picker assembly.	8-7
		Replace picker control PCBA.	8-16
		Replace power distribution PCBA.	8-49
		Replace rotary-axis motor.	8-14
		Perform the actions in service Action Code "73 xx".	6-10
90 00	A down level main controller board was detected by the Library firmware when a new board is required for this library configuration to operate.	Update the library firmware.	4-114
91 00	A down level picker control board was detected by the library firmware when a new board is required for this library configuration to operate.	Update the firmware.	4-114
92 xx	A down level board was detected by library firmware when a new board is required for this library configuration to operate.	Update the firmware.	4-114

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
93 xx	A failure was detected in drive communication hardware within the library: library cannot communicate with one or more drives (note the physical location of the failing drive, this information is presented with the SAC).	<p>If the accompanying message indicated that the library cannot communicate with one specific tape drive:</p> <ul style="list-style-type: none"> • Make sure the tape drive in question is properly installed in its drive slot. • Verify code installed in drive PCBA. • Replace failing tape drive sled. • Replace cable between power distribution board and the failing drive. • Replace power distribution board. 	<p>4-117</p> <p>8-4</p> <p>8-28</p> <p>8-49</p>
		<p>If the library cannot communicate with multiple drives:</p> <ul style="list-style-type: none"> • Replace the power distribution board. • Replace library main controller board • Replace cable between power distribution board and the failing drive. 	<p>8-49</p> <p>8-34</p> <p>8-28</p>
94 xx	<p>Communication was previously established between library and tape drive but the library detected communication is no longer present or the drive status is not as expected.</p> <p>Note: Coordinates of the failing tape drive sled is posted on Operator panel but if this information was reset by the Operator, it can be retrieved by going to the error log and refer to the error modifier "xxxx", this value will show the failing drive</p>	<p>If SAC modifier "xx" = "00":</p> <ul style="list-style-type: none"> • Make sure that the failing tape drive sled is properly installed and powered on. • See if there is a cartridge in the failing tape drive preventing the drive from becoming ready. If cartridge is present eject the cartridge, retry the operation replacing the tape drive sled if appropriate. • Replace the power distribution board. • Replace cable between failing tape drive and power distribution board. 	<p>8-4</p> <p>8-49</p> <p>8-28</p>
		<p>If the SAC modifier "xx" = "3x" (where x equals 1 through 6), replace tape drive sled identified by SAC modifier.</p>	<p>8-4</p>
95 xx	Picker assembly delivered a cartridge to a tape drive but the drive does not confirm tape loading status. The "xx" part of the SAC identifies the drive.	<p>If another tape drive is available, retry the operation by loading the same cartridge into that tape drive:</p> <ul style="list-style-type: none"> • If the operation failed, inspect the cartridge for damage and replace it. • If the operation is successful, verify that the original failing tape drive is failing by loading another cartridge into that drive. Replace the drive if this operation failed. 	8-4
98 xx	The firmware installed on the tape drive is not supported by the Library. The "xx" part of the SAC identifies the drive.	Update the drive firmware with the latest level.	4-114
A0 xx	Communication is not established between the main controller and the RMU.	Ensure RMU is properly installed in the library.	5-7
		Reseat cable between main controller board and RMU.	9-27
		Replace RMU.	8-39
		Replace main controller board.	8-34

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
A1 xx	A generic communication error was detected between the main controller board and one of the auxiliary controller boards in the library. Use the SAC modifier "xx" and follow the appropriate actions below.	If the SAC modifier "xx" = "00": <ul style="list-style-type: none"> Reseat cable between main Controller and picker controller board. Replace picker control board. Replace library main controller board. Replace the display assembly. 	9-27 8-16 8-34 8-47
		If the SAC modifier "xx" = "10": <ul style="list-style-type: none"> Reseat cable between main Controller and picker controller board. Replace picker control board. 	9-27 8-16
		If the SAC modifier "xx" = "20": <ul style="list-style-type: none"> Reseat Cable between main control and display control board. Replace display control board. 	9-27 8-47
		If the SAC modifier "xx" = "3x": <ul style="list-style-type: none"> Reseat serial communication cable between main control and power distribution board. Replace drive sled x. 	9-27 8-4
		If the SAC modifier "xx" = "40": <ul style="list-style-type: none"> Replace host interface board (SCSI). 	8-45
		If the SAC modifier "xx" = "50": <ul style="list-style-type: none"> Replace RMU. 	8-39
		Replace main control board.	8-34
A2 xx	Communication was initially established but is now lost between the main controller board and the picker control board. Note: Verify that the Picker Assembly with the latest ESD changes (DATE CODE of 05/12/03 or later) is installed.	Reseat the cable between main Controller and picker control boards.	9-27
		Replace the picker assembly.	8-7
		Replace the picker control board.	8-16
		Replace Library main controller board.	8-34
A3 xx	Communication was initially established but is now lost between the main controller board and the display control board.	Reseat the cable between main Controller and display control boards.	9-27
		Replace the display assembly.	8-47
		Replace the main controller board.	8-34
D0 xx	Library detected that one of the dc power supplies has failed, this error condition only occurs in libraries equipped with the dual dc power supplies feature.	Observe LEDs located on each dc power supply. The LED should be either green or red. Red LED indicates power supply had failed. Replace failing power supply.	8-54
D1 xx	Library detected ac input to one bank of the dc power supplies is missing. This error condition only occurs in libraries equipped with the dual dc power supplies feature.	Observe the LEDs located on each dc power supply. The LED should be either green of red. Red LED indicates the power supply had failed. Replace the failing power supply.	8-54
		Replace the power distribution board.	8-49

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
D2 xx	Library detected a fan has failed in one of the dc power supplies or in one of the tape drives.	If the SAC modifier xx = 00: <ul style="list-style-type: none"> • If the library has only one dc power supply, replace it. • If the library has 2 dc power supplies, the failing supply displays a red LED. Observe the LED on the power supplies and replace the failing one. 	8-55
		If the SAC modifier xx = 3x, replace the drive that is identified by the modifier x where x equals drive 1 through 6 (as shown in "Storage Slot Numbering" on page 1-15).	8-55
E0 xx	A cartridge is stuck in picker assembly, Operator intervention is required to remove cartridge from the grip fingers.	Perform procedure "Cartridge Removal from Picker Assembly" on page 8-3.	
E1 00	I/O station door is not fully closed, Operator intervention is required to close the door.	Close the door on the I/O station.	
E2 xx	Front door is not fully closed. Operator intervention is required to close the door.	Close the front door.	
		If the SAC code is intermittent, replace the door switch.	8-58
E3 00	Wrong SCSI bus connection is detected. A single-ended SCSI device is connected to library configured in differential mode.	Check library configuration to ensure all devices on the library SCSI port have the same SCSI type.	
		If problem is not corrected, perform the actions in SAC "30 00".	
E4 00	Wrong SCSI bus connection is detected. A single-ended SCSI device is connected to library configured in differential mode.	Check library configuration to ensure that all devices on the library SCSI port have the same SCSI type.	
		If the problem is not corrected, perform actions in SAC "31 00".	
E5 00	SCSI bus connected to library is not properly terminated.	Ensure that both ends of the SCSI bus connected to library are properly terminated. A terminator is shipped with each library SCSI adapter card.	
		If the problem is not corrected, perform the actions in SAC "30 00".	
E6 00	SCSI bus connected to library is not properly terminated.	Ensure that both ends of the SCSI bus connected to library Port are properly terminated. A terminator is shipped with each library SCSI adapter card.	
		If the problem is not corrected, perform the actions in SAC "31 00".	

Table 6-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
E7 xx	Picker assembly detected a cartridge is not present in the grip fingers. Cartridge may not be seated properly in grip fingers or the get operation is not successful. Locate the cartridge in question:	If cartridge is not properly seated in the grip fingers, remove the cartridge. Insert cartridge in any empty slot and retry the operation.	
		If cartridge is not in the Picker but located in its original slot, see if the cartridge is seated too tightly in the slot. If cartridge is seated too tight in the slot replace the magazine, reinventory and retry the operation.	
		Run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> • If the diagnostic failed: replace the picker assembly. • If the diagnostic passed, you may have an intermittent problem. Retry the diagnostic several times and replace the picker assembly if appropriate. 	8-7
E8 xx	During a move to put cartridge after a successful get command, the picker assembly detected the cartridge is no longer present in the grip fingers. Locate cartridge in question:	If a cartridge is found: Recover cartridge, reinventory Library and retry the operation.	
		If a cartridge is not found, run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> • If diagnostic failed: replace the picker assembly. • If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and replace the picker assembly if appropriate. 	8-7
EA 00	Failures were detected while running the diagnostic loop test from main controller board to all sensors on the I/O station assembly.	Replace Library main controller board.	8-34
		Replace display control board.	8-47
		Replace the I/O station assembly	8-50
		Replace the Display Cable.	8-25
F0 00	Failures were detected while running diagnostic loop test from main controller board to the picker control board.	Replace library main controller board.	8-34
		Replace picker control board.	8-16
		Replace Y-axis flex cable.	8-24
F1 00	Failures were detected while running diagnostic loop test from main controller board to the display control board.	Replace library main control board.	8-34
		Replace display control board.	8-47
		Replace the display panel cable.	8-47
F7 00	Failures detected in the main controller board during POST.	Replace Library main controller board.	8-34
F8 00	Failures detected in the picker control board during POST.	Replace library picker control board.	8-16
F9 00	Failures detected in the display control board during POST.	Replace display control board.	8-47
FA 00	Failures detected in the SCSI host interface board (SCSI) during POST.	Replace host interface board (SCSI).	8-45
FB 00	Invalid SAC (No Longer Supported)	<ul style="list-style-type: none"> • Press OK on library Operator panel to clear SAC. • Ensure library firmware is at latest level. 	4-117

Operator Intervention Messages

Table 6-2 describes the operator intervention messages. Each intervention message is composed of four lines. The third or fourth, or both, lines may contain variable information specific to the message. To determine the meaning of the SAC (in the Message Lines column), see “Service Action Codes” on page 6-3. Codes that contain error modifiers (in the Variables column) are for Engineering use only.

Table 6-2. Operator intervention messages

Message Lines	Variables
Alert not found. Press OK.	None
-->ERROR!<-- Initialization Error Code: 0x%Y	%Y = 4-digit error modifier
-->PERM ERROR!<-- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
-->PERM ERROR!<-- SYSTEM WILL REBOOT SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->SYSTEM REBOOTED<- NEW CODE LOADED Version %X.%YY.%ZZZ	current version %X = 1-digit major rev %Y = 2-digit minor rev %Z = 4-digit minor rev
->SYSTEM REBOOTED<- RECOVERED FROM ERROR SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->SYSTEM REBOOTED<- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
->TOO MANY ERRORS!<- CALL FOR SERVICE SAC :%X Code:0x%Y	%X = 2-digit hex %Y = 4-digit error modifier
INTERVENTION NEEDED! Close the I/O station to complete the action.	None
INTERVENTION NEEDED! Unexpected door open detected. Make sure the door is closed.	None
INTERVENTION NEEDED! Single-ended device detected on this Differential bus.	None
INTERVENTION NEEDED! Check SCSI bus port 0 connector and/or termination.	None
INTERVENTION NEEDED! Remove cartridge in picker and return to storage.	None

Table 6-2. Operator intervention messages (continued)

Message Lines	Variables
BAD MEDIA Cannot get type. Please label media. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
INTERVENTION NEEDED! Remove cartridge from slot. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
UPSIDE DOWN MEDIA Ensure cartridge is in slot properly. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
SLOT IS OBSTRUCTED Please check to see if slot is empty. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
SLOT IS EMPTY Please check to see if slot is full. Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
DRIVE COMM FAILED Please verify drive communication path. Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE SCSI ID FAILED Please verify drive SCSI id setting for Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
TAPE PUSH FAILED Please remove tape from drive. Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE INIT FAILED Please correct drive initialization for Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
DRIVE CLEAN FAILED A cleaning operation failed to clean Drive %N [%X %Y %Z]	%N = drive number %X = column number %Y = magazine number %Z = slot number
INVALID LABEL Please check media for valid label Slot [%X %Y %Z]	%X = column number %Y = magazine number %Z = slot number
DUPLICATE LABEL Please check volsers at element address %X and %Y	%X = element address %Y = element address The screen message [0 @ 0] indicates that the cartridge is on the picker assembly
SER NUMBER MISSING Please enter the system serial number via the monitor.	None

Table 6-2. Operator intervention messages (continued)

Message Lines	Variables
One or more drives has downlevel firmware. You may wish to update these drives. See your user documentation.	None
Your library firmware versions do not match. Download the latest version to the library.	None
The Use-Count must be less than the Max-Count. Value Range: 0-99.	None
Autoclean is disabled. Access is denied. Use autoclean's Setup menu to enable.	None
No fixed cleaning slots installed. Autoclean access is denied.	None
You are changing the I/O configuration. Autoclean will automatically be disabled.	None
CLEAN TAPE MISSING A previously defined tape is missing: %X	%X = cartridge number
CLEAN TAPE EXPIRED Please remove the cleaning tape number %X	%X = cartridge number
No cleaning tape in cleaning slot %X Write down data. Will remove record. Use-Count: %Y Max-Count: %Z	%X = cartridge number %Y = use-count number %Z = max-count number
Cleaning Power-Out Recovery failed for slot %X. Write down data and remove tape. Use-Count: %Y Max-Count: %Z	%X = slot number %Y = use-count number %Z = max-count number

Table 6-2. Operator intervention messages (continued)

Message Lines	Variables
No record for existing cleaning tape. Remove cleaning tape from slot %X manually and insert it via the front panel.	%X = slot number
Cleaning tape %X has expired. Export the cleaning tape via the front panel. See your user documentation.	%X = cartridge number
Your cleaning tapes are expired or not in the system. Please import a new cleaning tape.	None
%X of cleaning tape failed. Tape should not be in target position	%X = Import or Export
There is no cleaning slot available for importing new cleaning tapes.	None
Invalid cleaning tape inserted.	None
WARNING - There are no cleaning tapes available in any of your cleaning cells to perform cleaning.	None
There is no cleaning tape available in cleaning call %X to perform cleaning.	%X = slot number
There is no cleaning slot available for importing new cleaning tapes.	None
There is no tape in [1 A 1]. Please insert a cleaning tape and retry import	None
I/O station is configured as storage. Autoclean may not be enabled.	None

Table 6-2. Operator intervention messages (continued)

Message Lines	Variables
Partition is not accessible. Library configuration has changed.	None

Operator Information Messages

Table 6-3 lists the operator information messages.

Table 6-3. Operator information messages

Message Lines	Variables
INITIALIZING	None
OFFLINE	None
ONLINE	None
HOMING PICKER	None
TEACHING COLUMN [%X]	%X = column number
SCANNING COLUMN [%X]	%X = column number
INITIALIZING DRIVES	None
GOING READY	None
DOOR IS OPEN	None
PICKER HOME FAIL	None
PICKER NOT HOME	None
GOING ONLINE	None
GOING OFFLINE	None
-->ERROR!<--	None
REBOOTING	None
CARTRIDGE RECOVERY	None
CARTRIDGE IN PICKER	None
SELF TEST FAILED	None

Drive Error Codes

Note: Before removing the tape drive sled, preserve the drive dump. For instructions, see “Performing a Preserve Dump” on page 4-36.

Errors and informational messages that pertain to the tape drive are shown in the drive status area of the operator panel. Table 6-4 describes the codes that display.

Note: In this table, *enclosure* refers to the Ultrium Scalable Tape Library.

Attention: If the tape drive detects a permanent error and displays an error code other than 0, it automatically performs a drive dump. If you force a drive dump, the existing dump will be overwritten and data will be lost. After you force a drive dump, do not turn off the power to the tape drive or library, or you may lose the dump data.

Table 6-4. 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 1-25). 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 power connector is properly seated. 2. Ensure that the proper dc voltages are being applied within the tolerances allowed (see “Specifications” on page 1-25). 3. If the proper voltages are being applied but 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 6-4. 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: <p>Note: Do not force a new dump; the tape drive has already created one.</p> <ul style="list-style-type: none"> • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the <i>IBM Ultrium Device Drivers Installation and User's Guide</i>. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center. • Ultrium Tape Drives (to copy a drive dump, see "Copying a Drive Dump to Tape Cartridge Using the Operator Panel" on page 4-34). 2. Power the tape drive off and on, then retry the operation that produced the error. 3. If the problem persists, download new firmware and retry the operation. 4. If the problem persists, send the drive dump that you collected in step 1 to your Support Center. <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: <p>Note: Do not force a new dump; one already exists.</p> <ul style="list-style-type: none"> • Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the <i>IBM Ultrium Device Drivers Installation and User's Guide</i>. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center. • Ultrium Tape Drives (to copy a drive dump, see "Copying a Drive Dump to Tape Cartridge Using the Operator Panel" on page 4-34). 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 "Running Drive Diagnostics" on page 4-103.) <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 6-4. 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 tape 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 tape 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 “Running Drive Diagnostics” on page 4-103). <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 “Running Drive Diagnostics” on page 4-103). <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 tape cartridges or if you do not know the tape cartridge’s volume serial number, run the Normal Read/Write Test (see “Running Drive Diagnostics” on page 4-103):</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 “Running Drive Diagnostics” on page 4-103). <ul style="list-style-type: none"> – If the Head Read/Write Test () fails, replace the tape drive. – If the Head Read/Write Test () succeeds, replace the cartridges that caused the problem. <p>The error code clears when you remove the tape 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 tape 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 “Running Drive Diagnostics” on page 4-103): <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 “Running Drive Diagnostics” on page 4-103): <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 tape cartridges or if you do not know the tape cartridge’s volume serial number, run the Normal Read/Write Test (see “Running Drive Diagnostics” on page 4-103):</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 (refer to the appropriate section in the library’s operator guide guide): <ul style="list-style-type: none"> – If the Head Read/Write Test diagnostic (see “Running Drive Diagnostics” on page 4-103) fails, replace the tape drive. – If the Head Read/Write Test diagnostic (see “Running Drive Diagnostics” on page 4-103) succeeds, replace the cartridges that caused the problem. <p>The error code clears when you remove the tape cartridge or place the drive in maintenance mode.</p>

Table 6-4. 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, or the insertion of an FMR cartridge as a data cartridge.</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 “Running Drive Diagnostics” on page 4-103 and erase the FMR cartridge. • 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 “Running Drive Diagnostics” on page 4-103). 2. If the Media Test diagnostic test fails, replace the media. If it runs successfully, clean the drive. (See “Cleaning Drives” on page 4-135.) Then run the “Normal Read/Write” diagnostic test. (See “Running Drive Diagnostics” on page 4-103.) 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. <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 A-9. 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. The length of the cable between the devices should not exceed 500 m (1640 ft). See “Fixing Fibre Channel Errors” on page A-11. 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 (see “Tape Drive Sled” on page 8-4). • If the problem persists after replacing the drive, the problem is with the cable between the drive sled and the power distribution board, the power distribution board itself, or the main board. <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>
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, replace the tape drive. The drive is usable, though the single-character display continues to indicate an error and the status light flashes amber.</p> <p>The error code may clear when you cycle power to the tape drive or place it in maintenance mode.</p>
B	<p>No error or message is assigned. See error code 8 in this table.</p>

Table 6-4. Drive error codes (continued)

Code	Cause and Action
C	<p>The tape drive needs to be cleaned. Clean the tape drive. See the section about cleaning drives in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>.</p> <p>The error code clears when you clean the tape drive or place it in maintenance mode.</p>
d	<p>Fibre Channel AL_PA conflict. More than one device has the same address. Each device must have its own unique AL_PA address. See the section about setting Loop IDs in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>.</p>
D	<p>No error or message assigned. See error code 0 in this table.</p>
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 A-11.</p> <p>The error code clears when the drive detects light or when you place the drive in maintenance mode.</p>

Cleaning Cartridge Error Messages

Table 6-5. Handling errors during automatic cleaning

Error	Cause	Required Action
Non-cleaning cartridge imported	User error.	Export the non-cleaning cartridge to the I/O station (ignore the message about the cartridge being expired).
Missing cleaning cartridge	The cleaning cartridge was manually removed while the door was open.	Open the door of the library and manually insert a cleaning cartridge into the slot from which it is missing.
Unexpected cleaning slot full	A non-cleaning cartridge was placed into the fixed slot while the door was open.	Remove the non-cleaning cartridge from the fixed slot.
Cleaning tape usage limit met	The cartridge used its allotted cleanings.	Export the expired cartridge to the I/O station and discard it.
All cleaning tapes used	All cartridges used their allotted cleanings.	Export the expired cartridges to the I/O station and discard them. Insert new cleaning cartridges into the library.
Failed get or put of cleaning tape	Electromechanical failure.	Note the SAC code that displays on the operator panel, then refer to "Service Action Codes" on page 6-3 to resolve the error.
Power outage while handling cleaning tape	User error or random power failure.	Access the automatic cleaning function and determine which columns contain cleaning cartridges (see the Operating Procedure chapter in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>). Open the door of the library and inspect the columns to determine from which slot the cleaning cartridge is missing. Manually remove the cleaning cartridge from the gripper and return it to the slot from which it is missing.
Power outage while cleaning drive	User error or random power failure.	Reapply the power and allow the drive to complete the operation.

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Tape Library Subsystem Overview



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Figure 7-1. Tape Library Overview (Standalone Model)

- 1** Operator/CE Panel Display
- 2** Front Door
- 3** Door Lock

- 4** Louvre (Air Vent)
- 5** I/O Station
- 6** Casters

Tape Library Front View

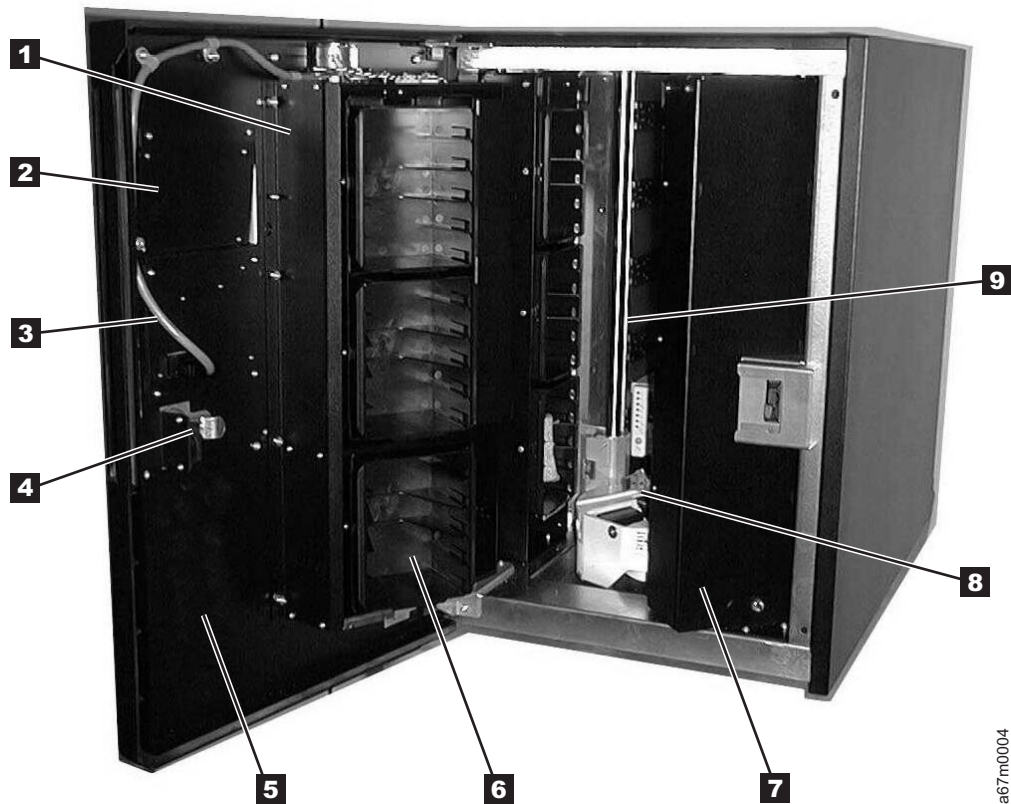


Figure 7-2. Front view of tape library with door opened

- | | | | |
|----------|------------------------------|----------|----------------------|
| 1 | I/O Station | 6 | I/O Station Column 1 |
| 2 | Operator/CE Panel Assembly | 7 | Storage Column 5 |
| 3 | I/O Station Cable Harness | 8 | Picker Assembly |
| 4 | Door Lock & Interlock Switch | 9 | Y-Axis Drive Shaft |
| 5 | Front Panel (Lower) | | |

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Rear View of Tape Library with SCSI Attachment

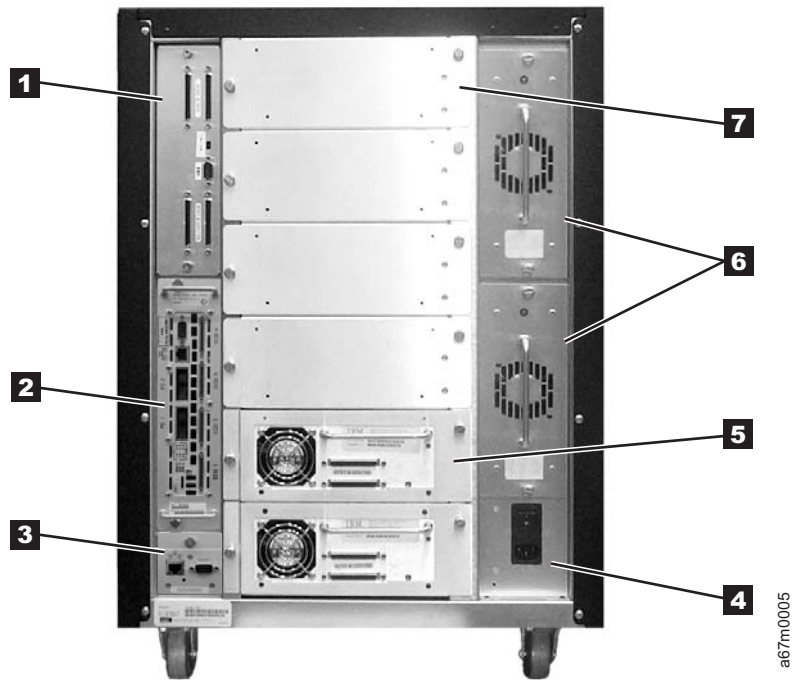


Figure 7-3. Rear view of tape library with SCSI attachment. The drive contains Ultrium 1 Tape Drives. Figure shows converted library.

- | | | | |
|----------|------------------------------------|----------|---|
| 1 | Host Interface Board | 5 | SCSI Tape Drive Sled |
| 2 | SAN Data Gateway Module (optional) | 6 | DC Power Supply & Redundant dc Power Supply |
| 3 | RMU | 7 | Filler Panel |
| 4 | AC Input Power Module | | |

Rear View of Tape Library with Native Fibre Channel Attachment

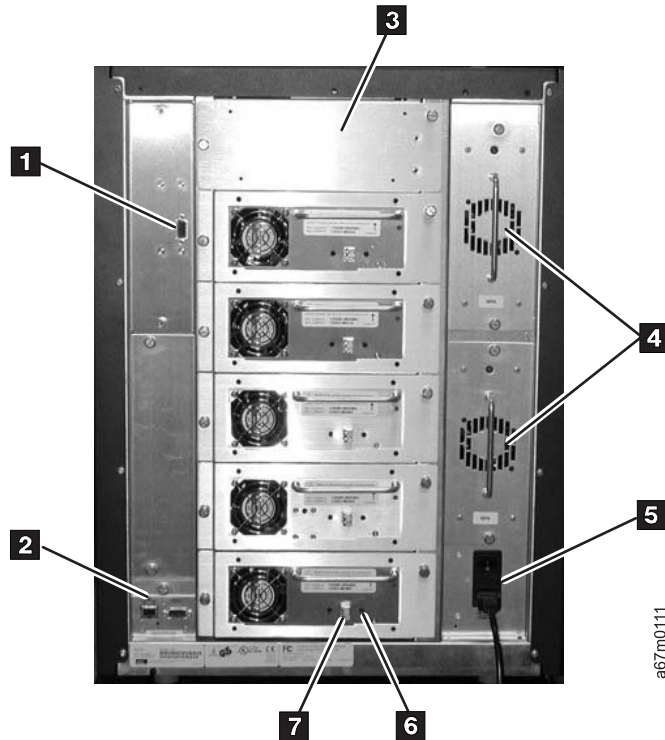


Figure 7-4. Rear view of tape library with native fibre channel attachment. The drive contains Ultrium 2 Tape Drives.

- | | | | |
|----------|---|----------|-----------------------|
| 1 | Serial Diagnostic Port Board | 5 | Ac Input Power Module |
| 2 | Remote Management Unit | 6 | Fiber Tape Drive Sled |
| 3 | Filler Panel | 7 | LC Connector |
| 4 | DC Power Supply & Redundant dc Power Supply | | |

Tape Library Serial Ports

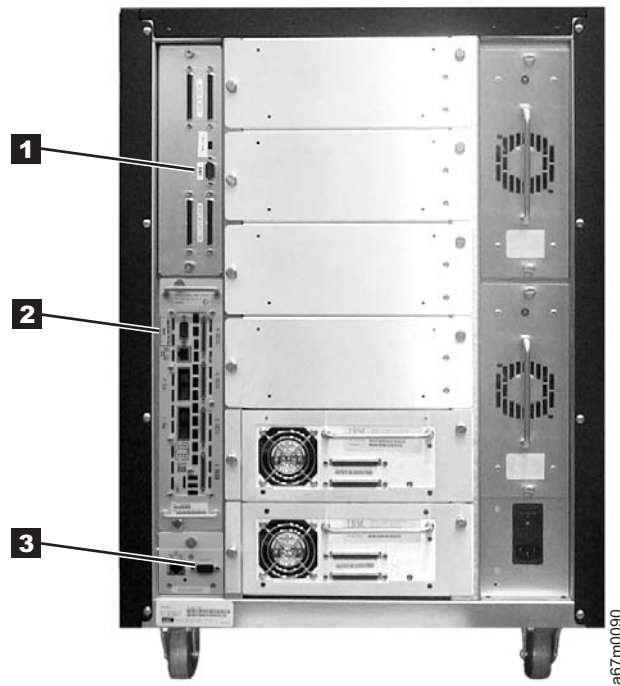


Figure 7-5. Tape library serial ports. Figure shows converted library.

- 1** Host Interface Board (SCSI) Serial Port, use only straight through serial cable.
- 2** SAN Data Gateway Module Serial Port with orange Null Modem label, use only Null Modem cable.
- 3** RMU Serial Port, use only straight through serial cable.

Y-Axis and Rotary-Axis Assembly

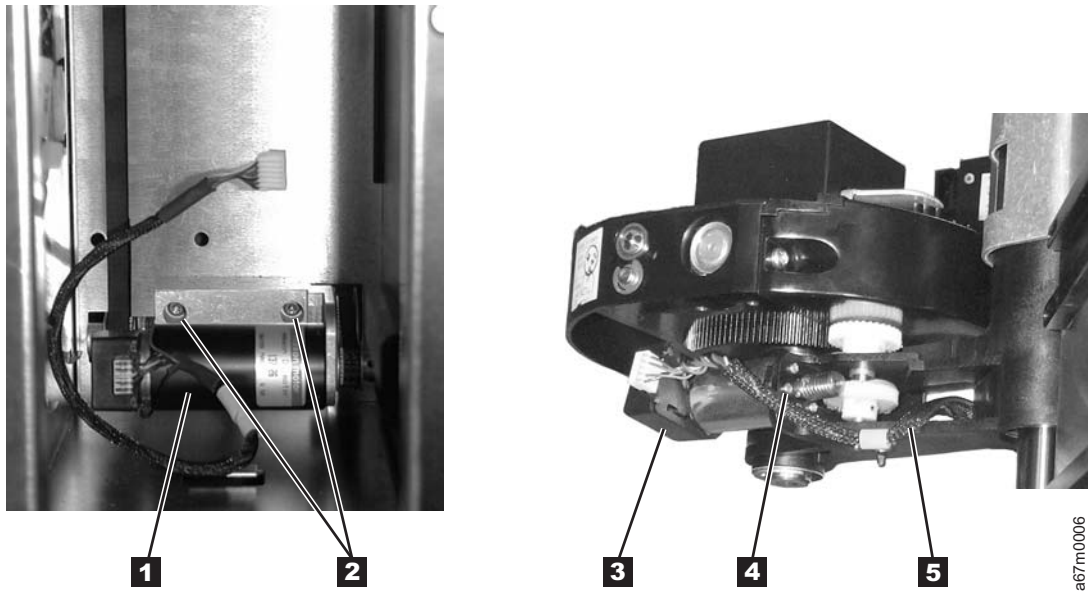


Figure 7-6. Y-Axis and Rotary-Axis Assembly

- 1** Y-Axis Motor Assembly
- 2** Y-Axis Motor Assembly Mounting Screws
- 3** Rotary Axis Motor Assembly

- 4** Rotary Axis Motor Mounting Screw (1 of 4)
- 5** Rotary Axis Cable Harness

Picker Assembly

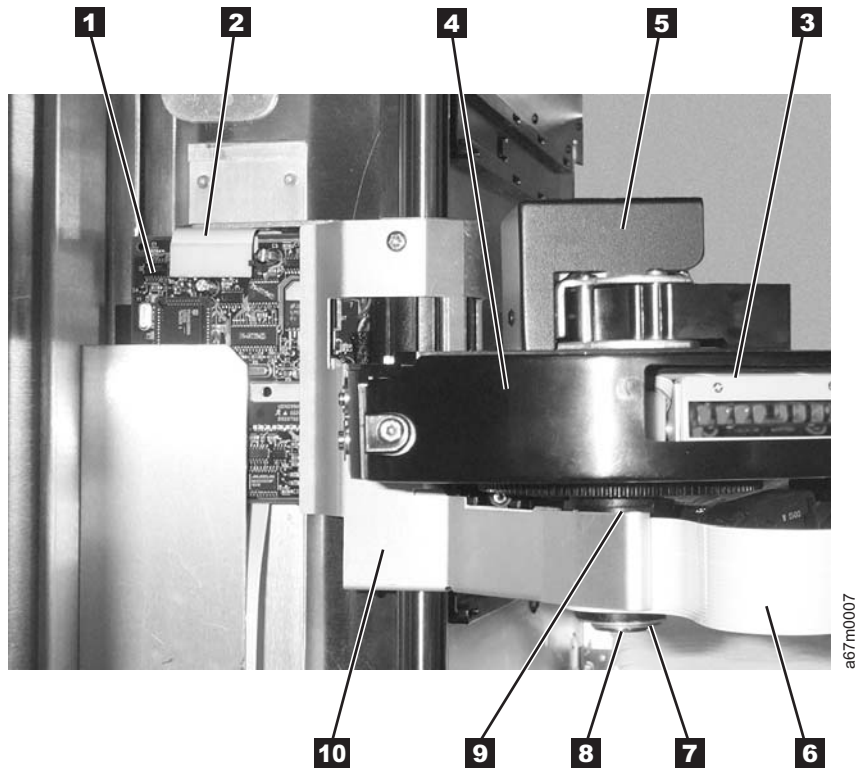
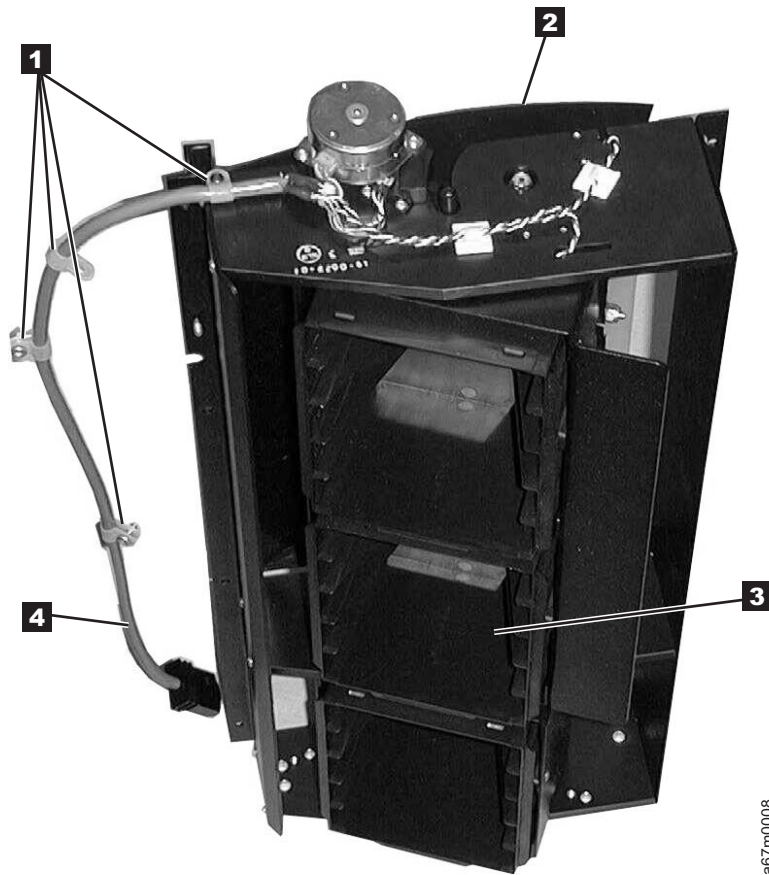


Figure 7-7. Picker Assembly

1	Picker Control Board	6	Picker Flex Cable
2	Y-Axis Flex Cable	7	E-clip & Washer
3	Bar Code Reader Scan Beam Window	8	Picker Shaft
4	Bar Code Reader Cover	9	Top Washer
5	Picker Assembly	10	Picker Flex Cable Cover

| **Note:** For proper orientation of picker control PCBA to picker support ground wire connector, see
| Figure 8-7 on page 8-10.

I/O Station (12 Slot)



a67m0008

Figure 7-8. Rear View of the I/O Station

- | | | | |
|----------|------------------|----------|------------------|
| 1 | Cable Clamps | 3 | Storage Magazine |
| 2 | I/O Station Door | 4 | Cable Harness |

I/O Station (Single Slot)

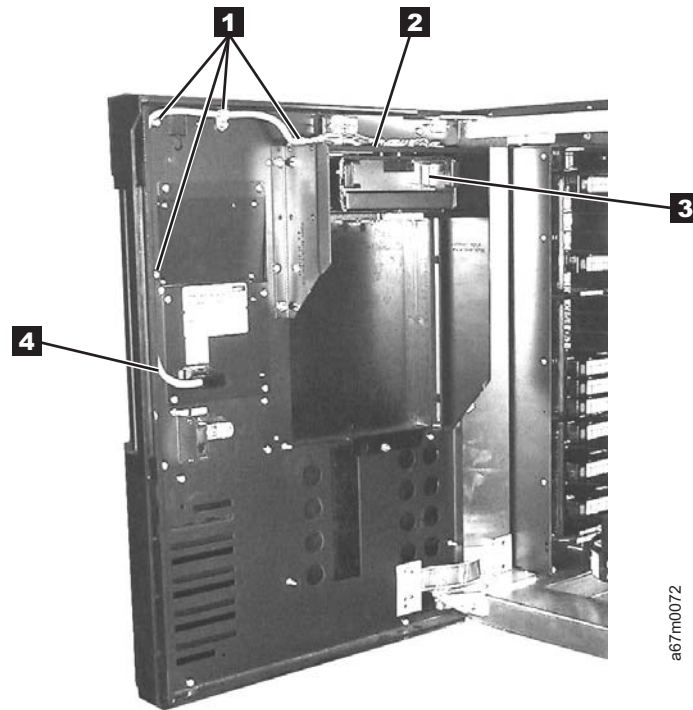


Figure 7-9. I/O Station (Single Slot)

- | | | | |
|----------|------------------|----------|------------------|
| 1 | Cable Clamps | 3 | Storage Magazine |
| 2 | I/O Station Door | 4 | Cable Harness |

Display Assembly

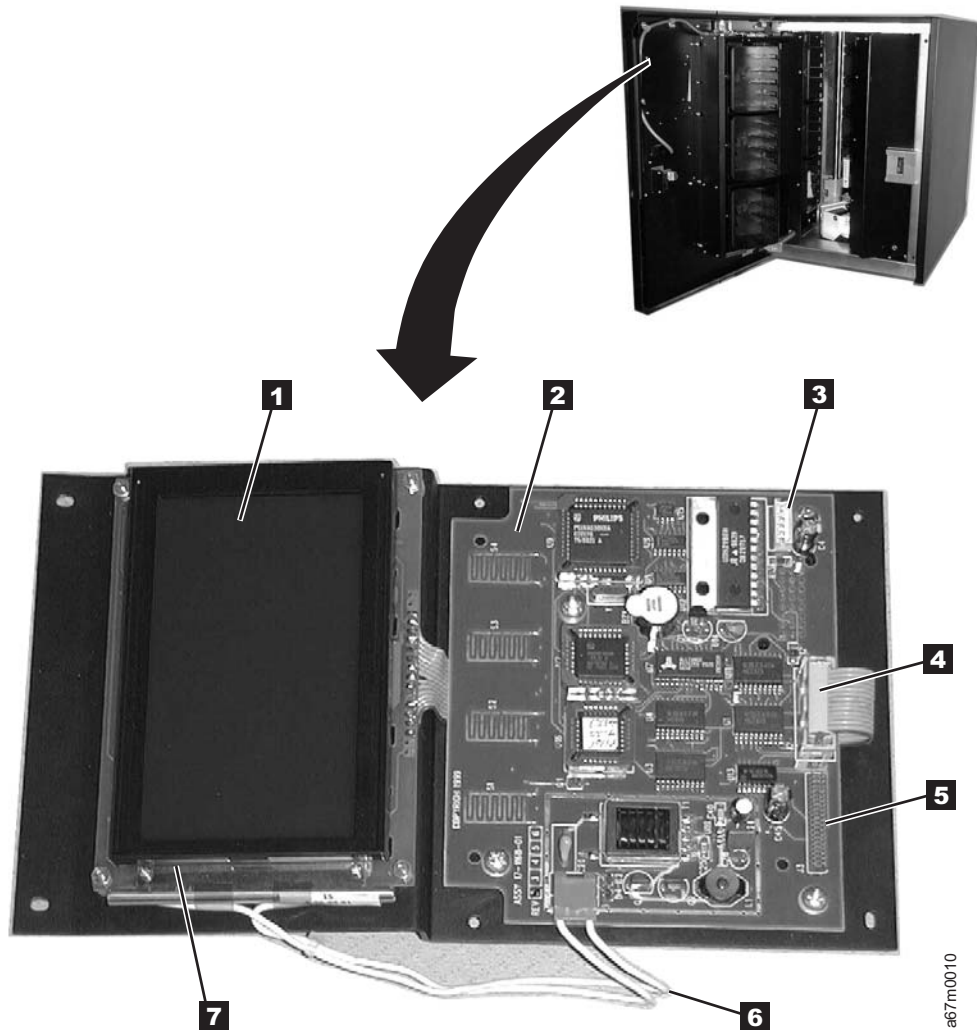


Figure 7-11. Operator panel assembly. The assembly supports both SCSI and native Fibre Channel attachment.

- | | | | |
|----------|--|----------|---------------------------------------|
| 1 | LCD Assembly | 5 | Cable Connector to Main Control Board |
| 2 | Display Control Board | 6 | Power Cable to Display Back Light |
| 3 | Cable Connector to Door Interlock Switch | 7 | Display Back Light |
| 4 | Cable to LCD Display Assembly | | |

Power Distribution PCBA (Type I)

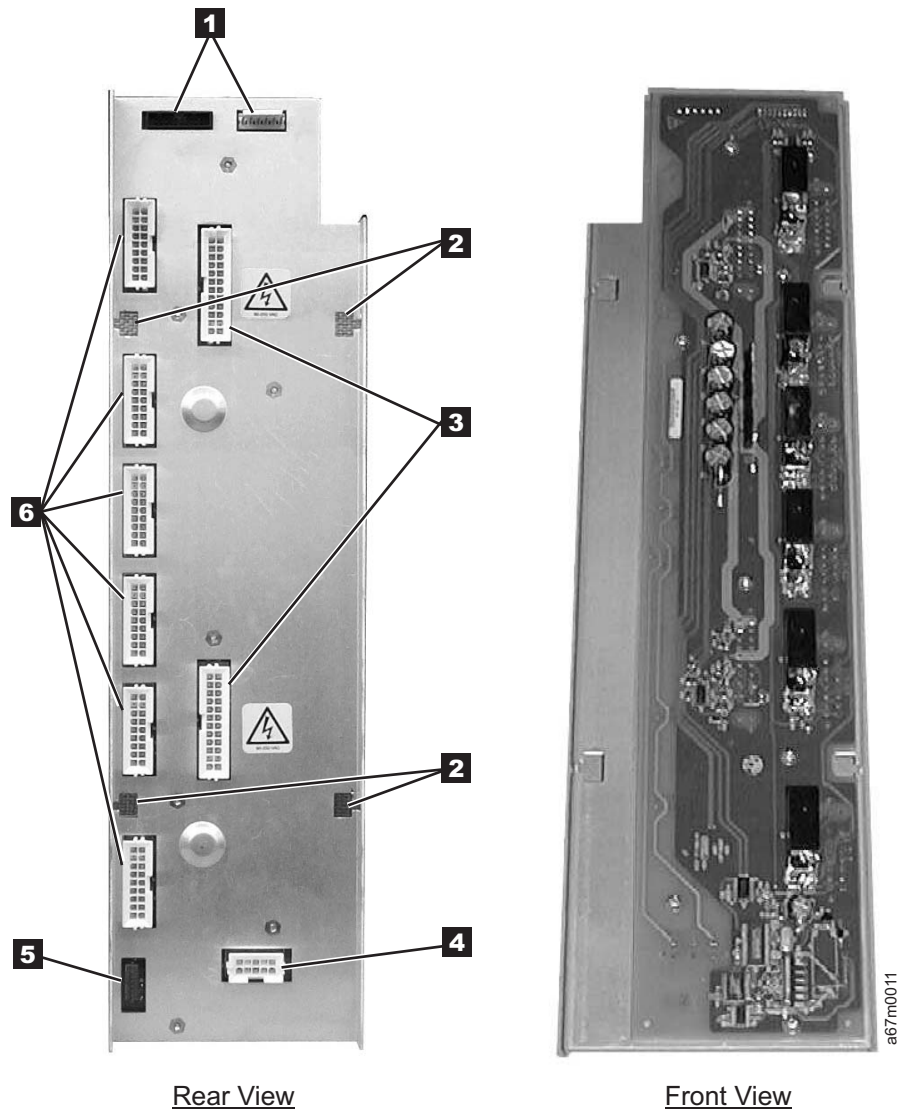


Figure 7-12. Power distribution PCBA (Type I)

- 1** Cable Connectors to Main Control Board
- 2** Mounting Holes
- 3** Cable Connectors to dc Power Supplies

- 4** Cable Connector to ac Input Power Module
- 5** Cable Connector to Y-Axis Motor Assembly
- 6** Cable Connectors to Drive Modules (Maximum six)

Power Distribution Board (Type II)

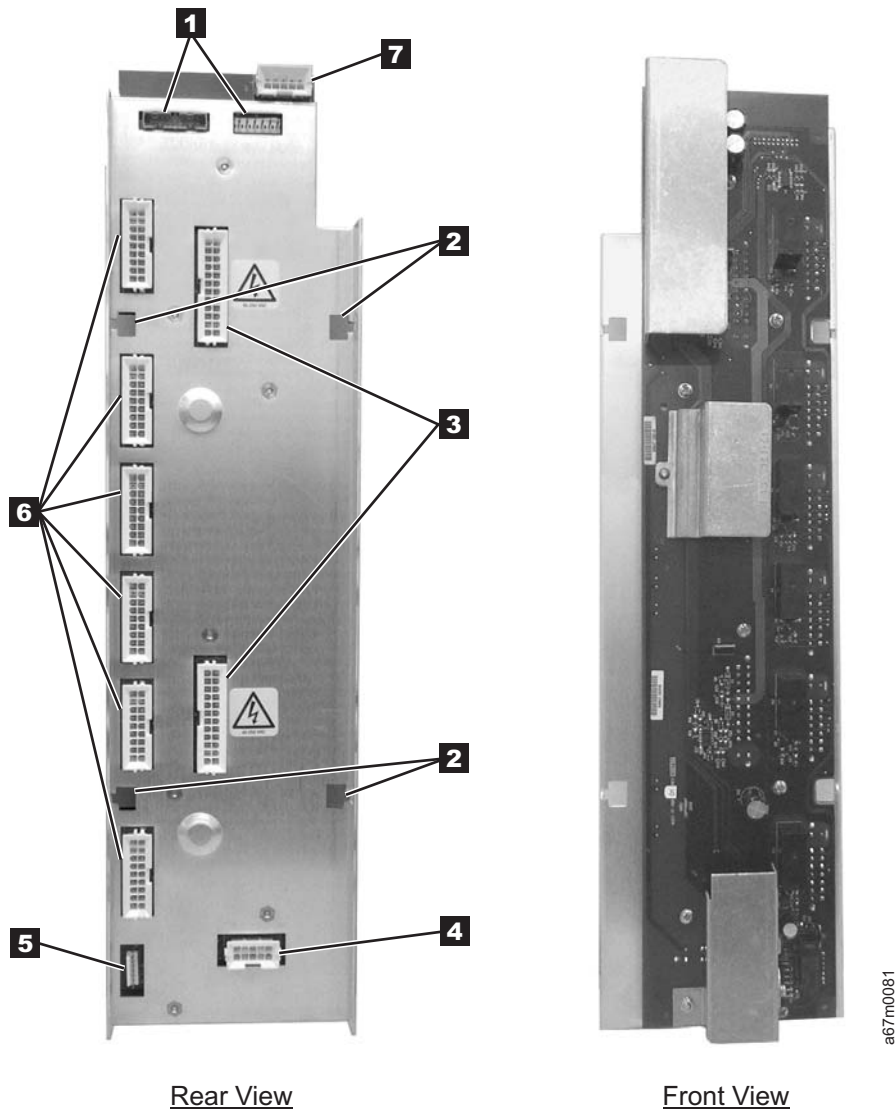
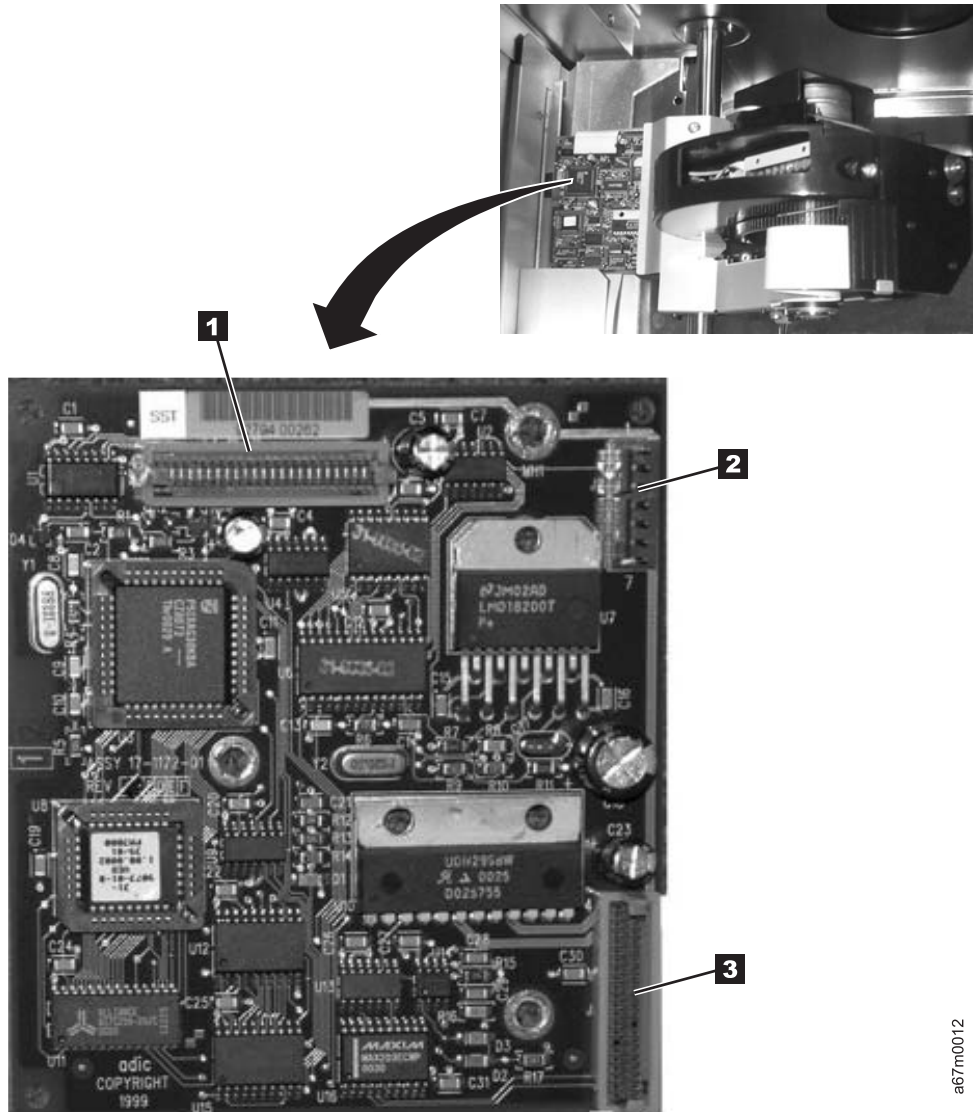


Figure 7-13. Power distribution PCBA (Type II)

- | | |
|--|--|
| <p>1 Cable Connectors to Main Control Board</p> <p>2 Mounting Holes</p> <p>3 Cable Connectors to dc Power Supplies</p> <p>4 Cable Connector to ac Input Power Module</p> | <p>5 Cable Connector to Y-Axis Motor Assembly</p> <p>6 Cable Connectors to Drive Modules (Maximum six)</p> <p>7 SAN Data Gateway Module Power Connector</p> |
|--|--|

Note: Includes sticker for new power architecture (NPA).

Picker Control Board



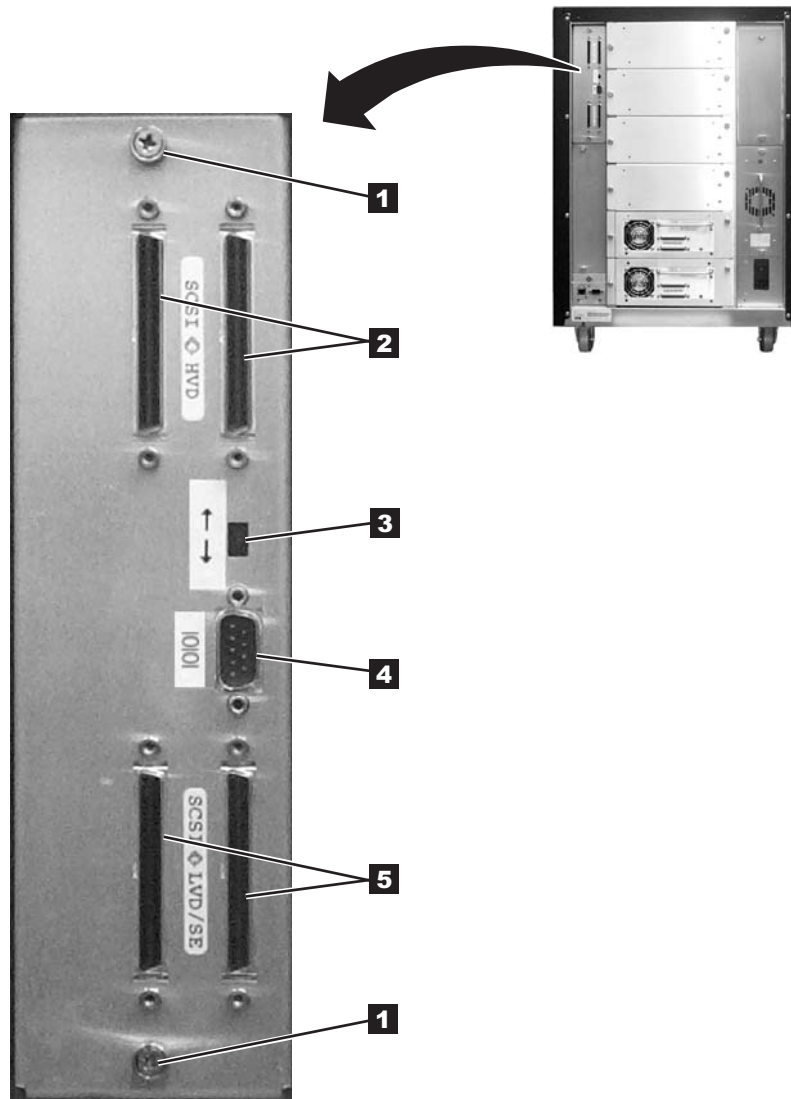
a67m0012

Figure 7-14. Picker control board

- 1** Y-Axis Flex Cable Connector
- 2** Rotary Axis Motor Cable Connector

- 3** Picker Assembly Flex Cable Connector

Host SCSI Interface Board



a67m0051

Figure 7-15. Host SCSI interface board for SCSI attachment. This board will appear in a converted library; however, only the serial port will be utilized.

- | | | | |
|----------|---------------------------|----------|---------------------------|
| 1 | Mounting Screws (Captive) | 4 | Serial Port Connector |
| 2 | HVD SCSI Cable Connectors | 5 | LVD SCSI Cable Connectors |
| 3 | LVD — HVD Selector Switch | | |

Serial Diagnostic Port Board

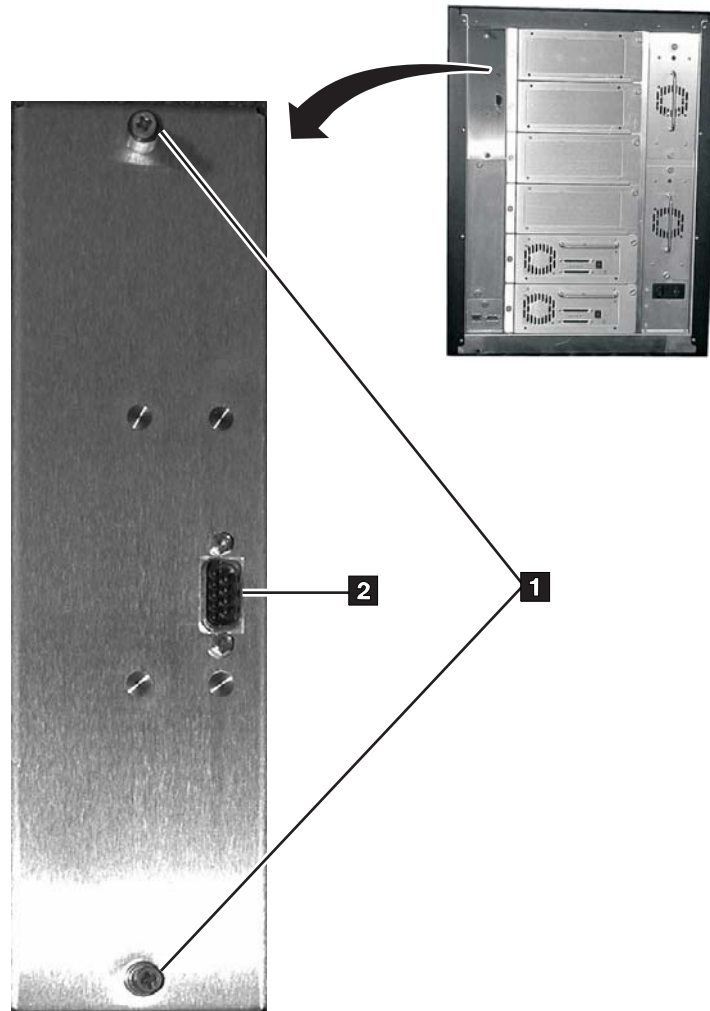


Figure 7-16. Serial diagnostic port board for native Fibre Channel attachment

1 Mounting Screws (Captive)

2 Library Serial Port Connector

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DC Power Supply Assembly

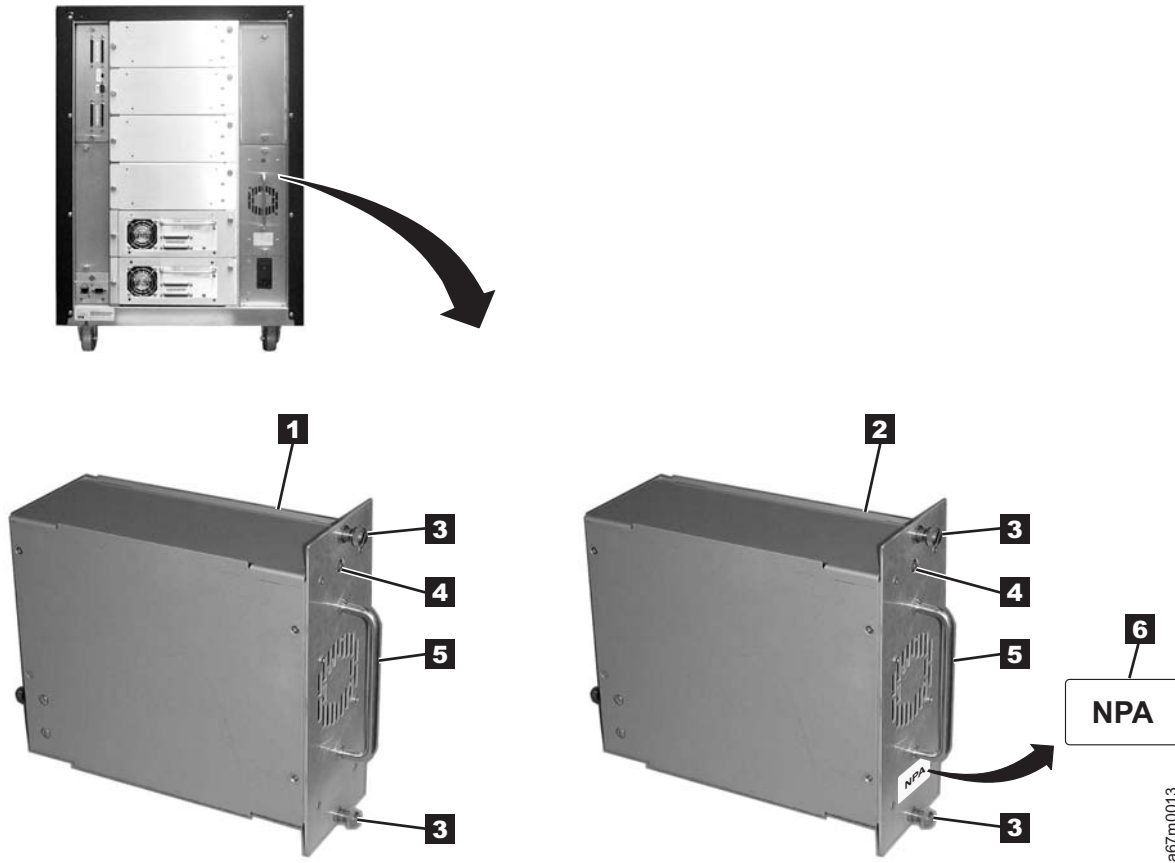


Figure 7-17. DC Power Supply Assembly. Figure shows converted library.

- | | | | |
|----------|---|----------|--|
| 1 | DC Power Supply (old) | 4 | Power Supply LED (Green = Good) (Red = Fail) |
| 2 | DC Power Supply (new, required for Fibre Channel support) | 5 | Handle |
| 3 | Thumbscrews (Mounting) | 6 | NPA Label (new power architecture) |

AC Input Power Module

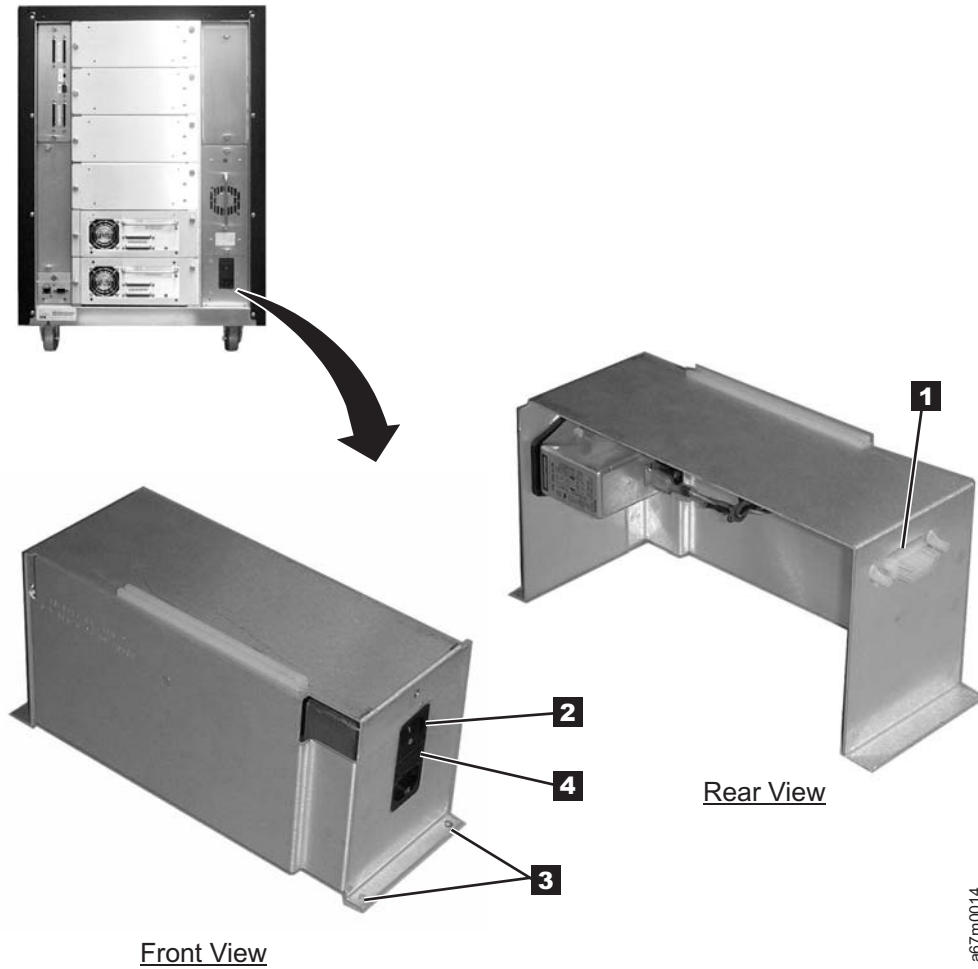


Figure 7-18. AC Power Input Module. Figure shows converted library.

- | | | | |
|----------|--|----------|----------------|
| 1 | AC Power Connector to Power Distribution Board | 3 | Mounting Holes |
| 2 | Main ac Power Switch | 4 | Fuse Holder |

SAN Data Gateway Module (optional)

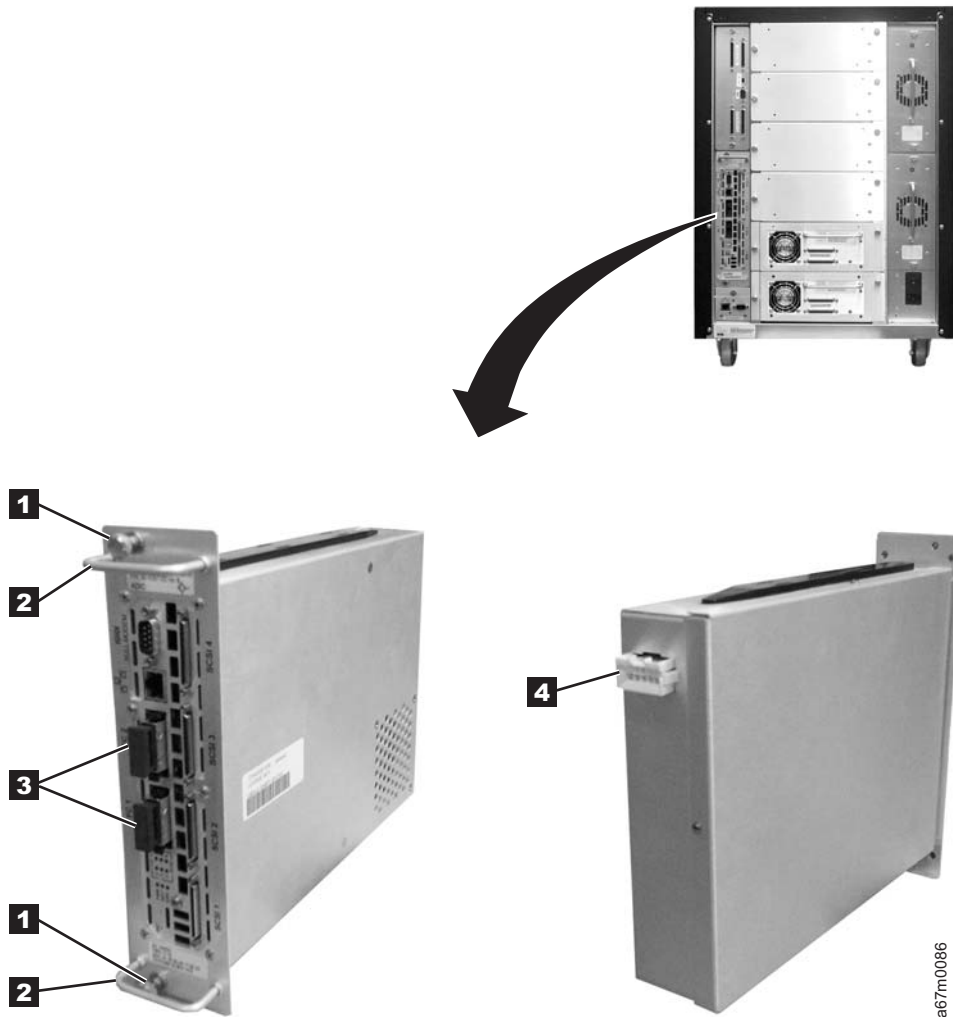
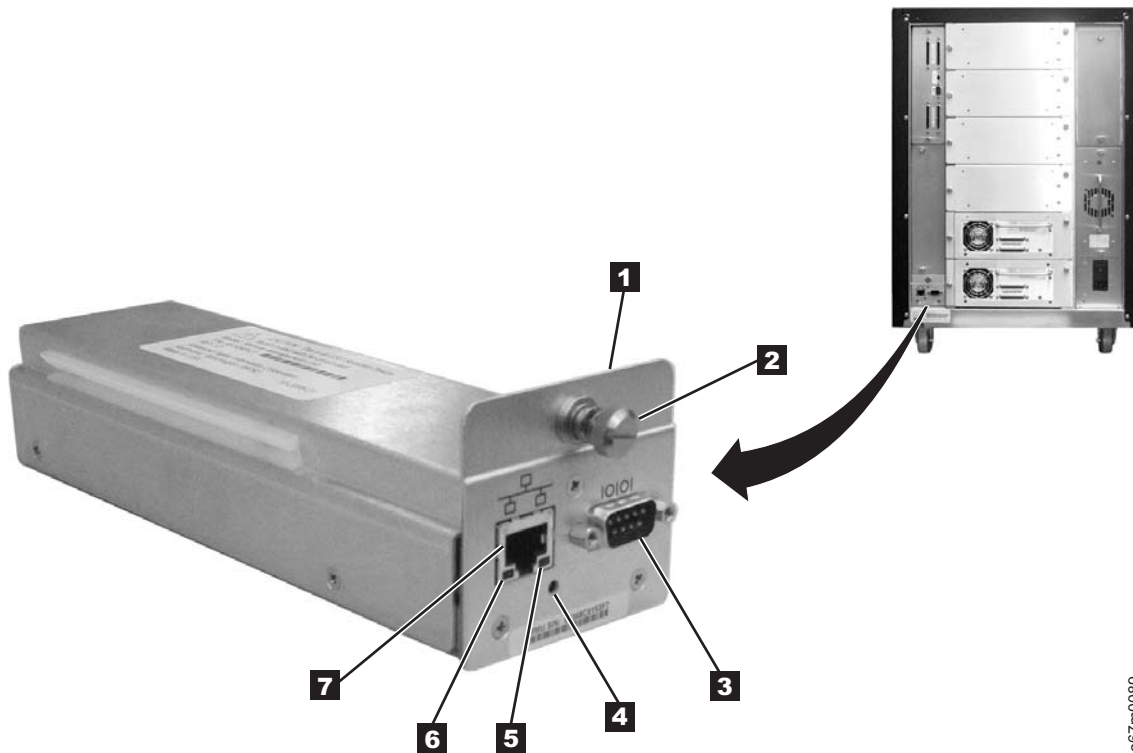


Figure 7-19. SAN Data Gateway Module (optional). Figure shows converted library.

1 Thumbscrew
2 Handle

3 2 Gbit GBIC
4 Connector to Power Distribution Board

Remote Management Unit



a67m0089

Figure 7-20. RMU. Figure shows converted library.

- | | | | |
|----------|-------------|----------|---------------------------|
| 1 | RMU | 5 | Speed LED (yellow) |
| 2 | Thumbscrew | 6 | Ethernet Link LED (green) |
| 3 | Serial Port | 7 | Ethernet Port |
| 4 | Status LED | | |
- Red = Power On/Failure
Yellow = Booting
Green = Initialized
Flashing Green = Active

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This section contains step by step procedures to adjust, remove and replace all Tape Library field replaceable units (FRUs).

Cartridge Removal from Picker Assembly

See Figure 8-1.

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Tape Library.
4. The grip fingers are spring-loaded. Open them by applying pressure to the back of one of the fingers **1** as seen in Figure 8-1. Remove the cartridge when the fingers are open.
5. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 8-43 on page 8-53.
6. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

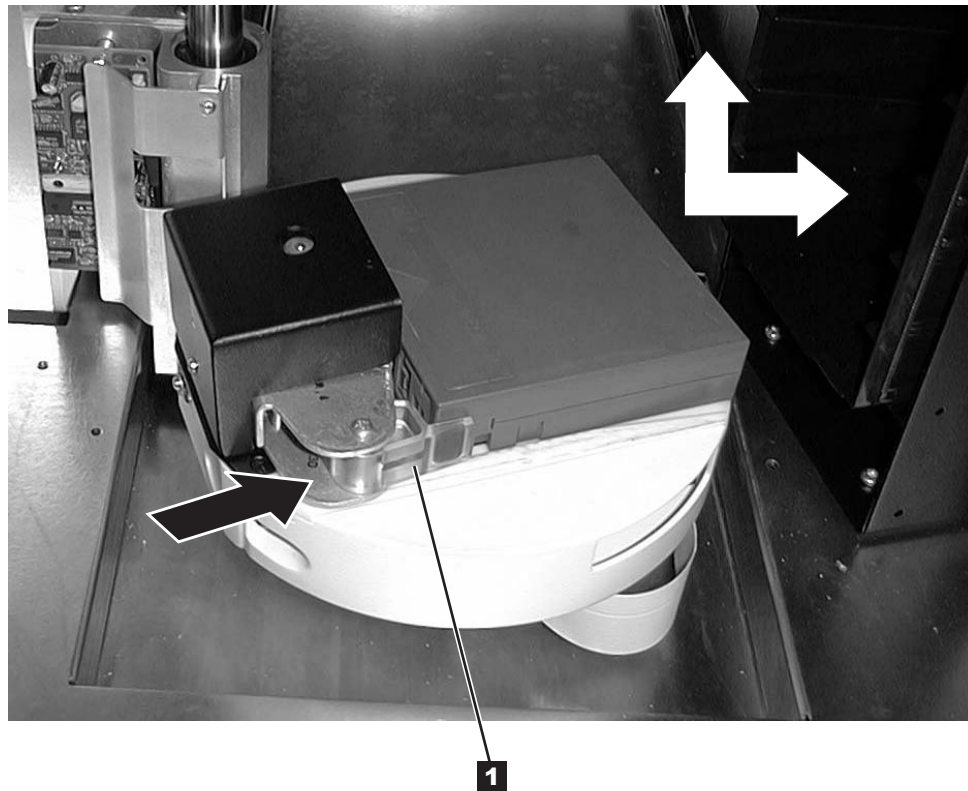


Figure 8-1. Cartridge Removal from Picker Assembly

Tape Drive Sled

Tools that are required: *None.*

Removing the Tape Drive Sled

Note: Before removing the tape drive sled, preserve the drive dump. For instructions, see “Performing a Preserve Dump” on page 4-36.

See Figure 8-2 for example of SCSI host connections (example on right). If there are multiple hosts that are connected to the drives, determine the SCSI bus that the failing drive is connected to.

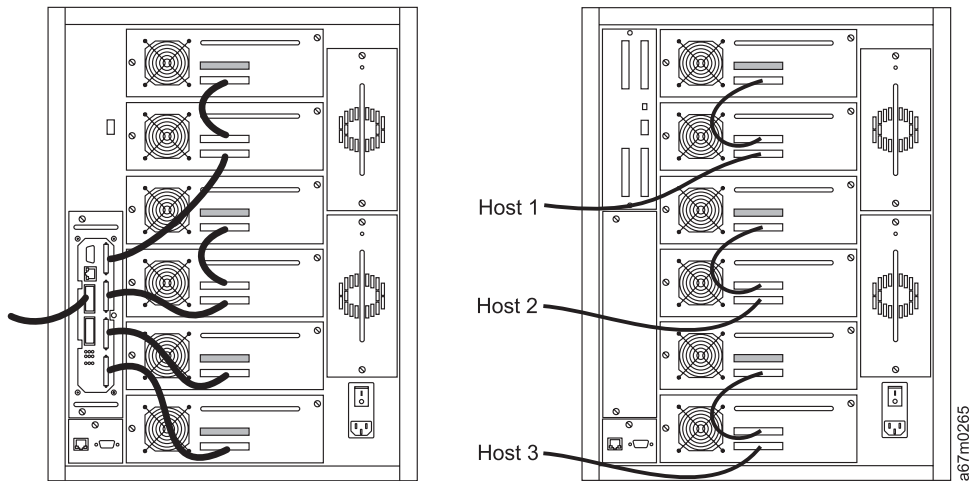


Figure 8-2. Cable Connections for a SCSI host attachment. Illustration on the right depicts a SCSI host attachment. Illustration on the left depicts a SCSI host attachment via a SAN Data Gateway Module.

See Figure 8-3 on page 8-5 for example of Fibre Channel host connections (example on left). If there are multiple hosts that are connected to the drives, determine the SCSI bus that the failing drive is connected to.

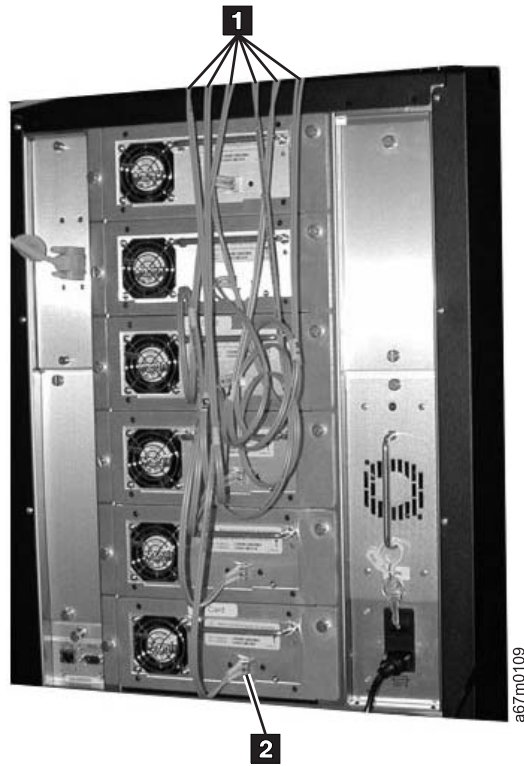


Figure 8-3. Cable Connections for a native Fibre Channel host attachment

See Figure 8-4 on page 8-6.

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*. **Ensure that the SCSI bus is quiesced before proceeding.**
2. Prepare the Library using the Operator Panel (**Main Menu** → **More** → **Service** → **Drives** → **Select Drives** → **OK** → **Repair** → **Remove**) prior to removing the Tape drive.
3. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
4. Disconnect all SCSI cables to the Drive Sled.
5. Loosen the two captive thumbscrews **1** from the drive sled **2** and slide the drive out using the drive handle **3**.
6. Return failing Tape Drive by using specified procedures.

Replacing the Tape Drive Sled

See Figure 8-4.

Perform the above procedure in reverse order.

Before you ask customer to vary the library online, wait for library to complete initialization. Initialization will take approximately six minutes after power is applied to the library. This allows the tape drive to be configured to SCSI address of failed tape drive.

Note: It is very important to be aware that each drive sled contains both drive firmware and library firmware.

- **Library firmware:** Replacement boards containing library firmware, such as the Tape Drive Sled, may come from stock with a firmware level other than the current firmware level that is in the other firmware components in the library. It is even possible that the firmware may be incompatible (non-multi-path architecture type firmware). Thus, it is very important to always check the firmware level of the library (**Main Menu** → **More** → **About** → **Details**) and update the firmware in the entire library to the **latest** level (see “Updating Firmware” on page 4-114). For proper operation of the library, ensure that the firmware level of the replacement part matches the library firmware level of the entire library.
- **Drive firmware:** Drive firmware in the drive within the replacement drive sled from stock may also be at a different level than the other drives in the library. While LTO 1 and LTO 2 drive types have different firmware levels, if the library contains both drive types, all the drives of both types (including the replacement drive) should be brought up to the latest level.

Note: The boot code of the new part does not have to match the boot code of the other parts in the library.

Notify the Library that a new drive is replaced by selecting (**Main Menu** → **Service** → **Drives** → **Repair** → **Replace**).

Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

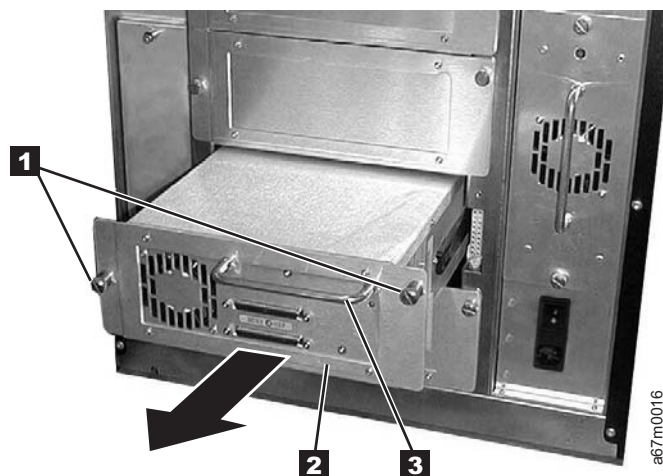


Figure 8-4. Tape Drive Sled Removal and Replacement

Picker Assembly

For Picker Assembly Part Number, see Table 15-1 on page 15-1.

See Figure 8-6 on page 8-9 for locations of the components in the following procedure:

Tools that are required: *Phillips screwdriver, Flat blade screwdriver, T8, T10 and T20 Torx drivers, flashlight.*

Removing the Picker Assembly

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Refer to Figure 8-26 on page 8-33 and remove the left front storage column (column 2) **2** by removing screws **1** and **5**. Screws **5** can be reached through holes **4**.
5. See Figure 8-6 on page 8-9 for step 5 through step 9. Lift the Picker Assembly and position it in the middle of the Y-shaft for easy access to its components.
6. Remove the T20 Torx screws **3**, then remove the sheet metal cover.
7. Disconnect the Picker Assembly Flex cable **7** from the Picker Control Board **1**.
8. Use a flat blade screwdriver to pry the E-clip **4** from the Picker shaft. Remove the E-clip and the washer **5** from the Picker shaft.
9. Lift the Picker Assembly up and remove it from the metal base.

Note: See Figure 8-5, there is another washer **1** between the Picker Assembly and the casting **2**. Do not lose this washer.

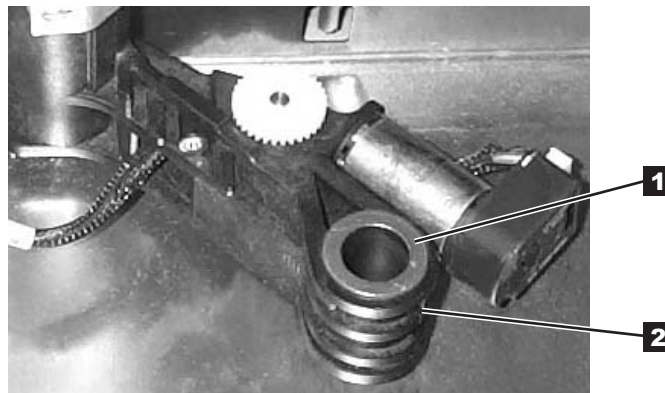


Figure 8-5. Flat Washer and Casting

Replacing the Picker Assembly

Note: See Figure 8-6 on page 8-9. Before attaching the flex cable cover with the Torx screws, raise the picker assembly and position the cover so that the two pins on the base casting are centered in the holes **6**. Now tighten the Torx screws. Be sure to install the ground strap, and note that the eyelets of the ground strap are of different sizes.

Perform the procedure for removing the picker assembly in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

For proper operation of the library, ensure that the firmware level of the replacement part matches the firmware level of the entire library.

Note: The boot code of the new part does not have to match the boot code of the other parts in the library.

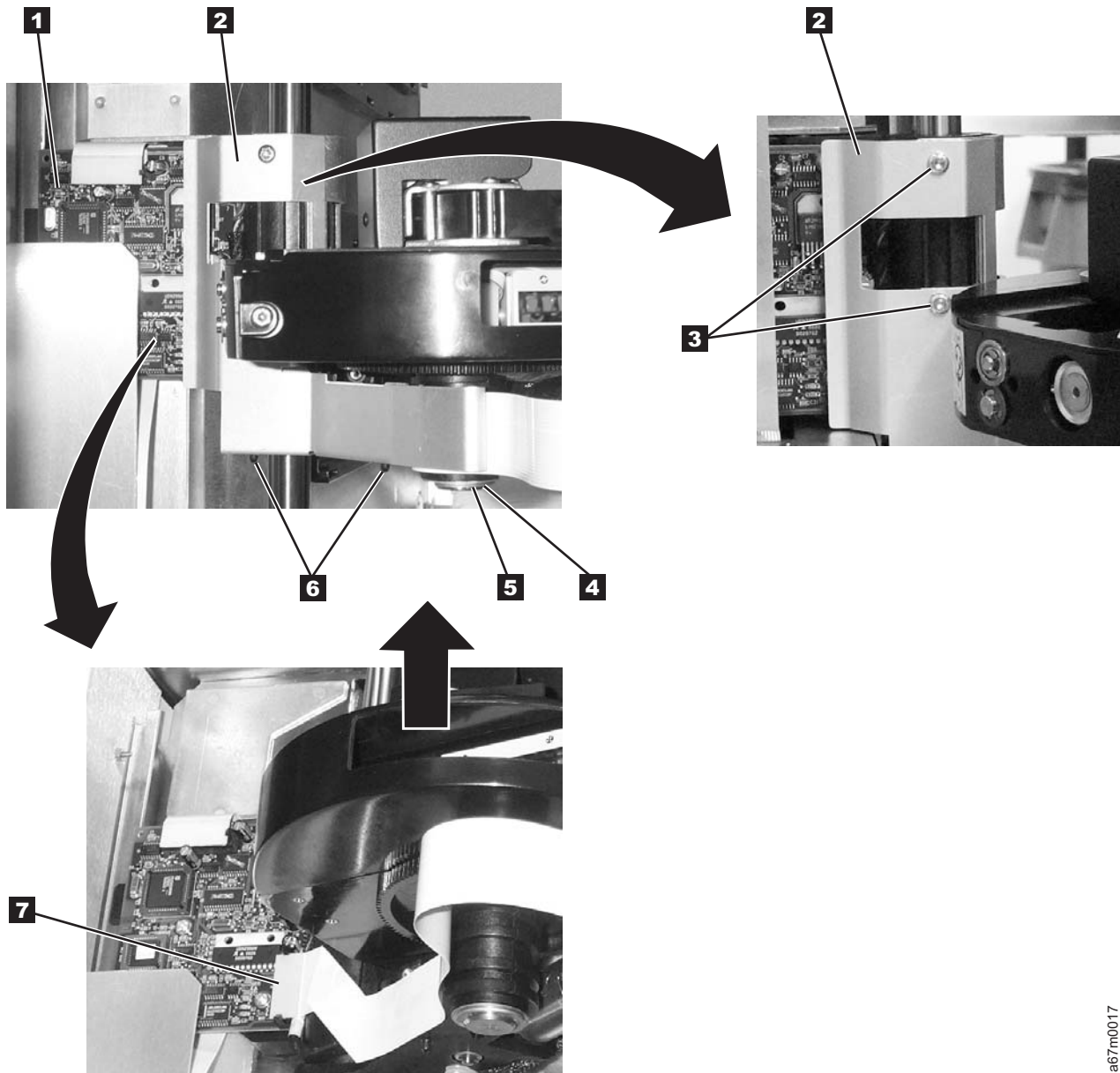


Figure 8-6. Picker Assembly Removal and Replacement

Make sure that the connectors on the ground wire between the Picker Control PCBA and the Picker Support are connected so that they do not protrude above the Picker Support. The correct orientation of the ground wire connectors is shown in Figure 8-7 on page 8-10.

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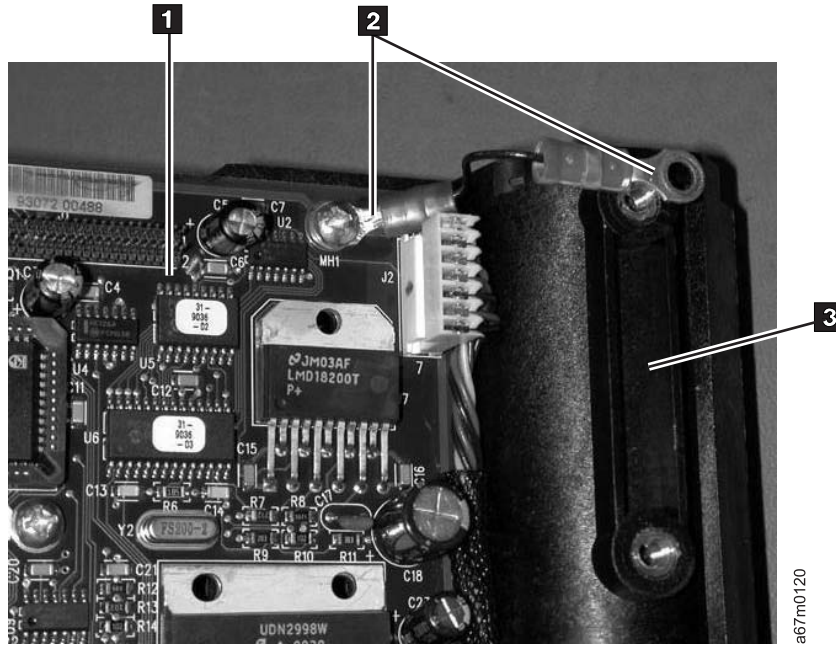


Figure 8-7. Proper orientation of picker control PCBA to picker support ground wire connector. Illustration shows ground strap disconnected from the Carriage Arm Assembly.

Picker Carriage Arm Assembly (Picker Assembly and Control Board)

Tools that are required: *Small Phillips screwdriver, T20 Torx drivers, 11/32 in. and 3/16 in. nut drivers, and flashlight.*

Removing the Picker Carriage Arm Assembly

When Tape Library is installed in a rack, you must remove Library from the rack before continuing with this procedure.

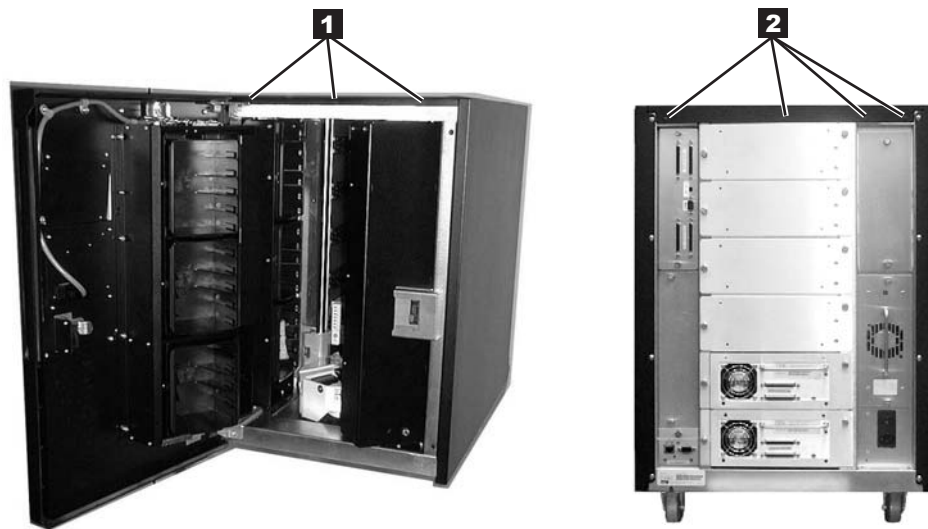
Attention: If the library is mounted in a rack, all drives and dc power supplies must be removed before the library is removed from rack. Because of the library weight you will need three people to lift the library out of the rack after the drives and dc power supplies are removed.



CAUTION:

The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons and/or a lifting device to safely lift this part or unit.(C011)

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Remove storage column 2 (left front). See procedure for removing the storage columns on page 8-32.
4. Perform one of the following:
 - If library is in a rack, perform steps 5 through 7.
 - If library is not in a rack, go to step 8.
5. Remove all Drive Sleds and/or blank panels. Note position of drives so each drive will be inserted in exactly the same position during replace procedure.
6. Perform the procedure to remove the power distribution board on page 8-49.
7. Remove library from rack.
8. See Figure 8-8. Remove the top cover being held to the chassis with three Phillips screws **1** in front and four Phillips screws **2** in back.



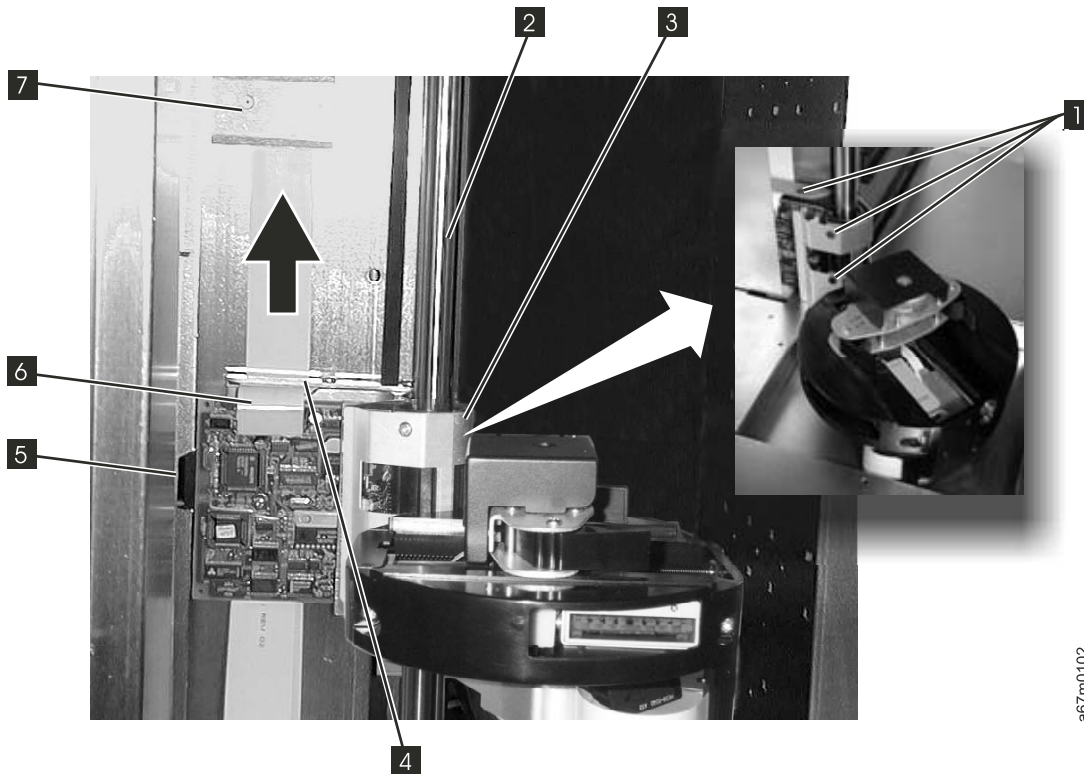
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Figure 8-8. Top Cover Removal

9. Remove the three Phillips screws attaching the drive shaft to the top of the chassis (see Figure 8-25 on page 8-31 **1**). From the front of the Library, unscrew the drive shaft counterclockwise out of the chassis bottom.

See Figure 8-14 on page 8-19 for step 10 through step 13:

10. Slide the Drive Shaft **2** up and out of Picker casting and on out through the top of library. Put the shaft aside where it will not be nicked or scratched.
11. Disconnect the Y-Axis Flex Cable **6** from the Picker Control Board. You may need to raise the Picker Assembly up to a serviceable position.
12. Remove the three screws **1** which hold the Picker Carriage Assembly **3** and Picker Board to the belt clamp plate. **When installing a new FRU assembly, ensure that the ground cable located behind the belt clamp plate is attached to the belt clamp plate.**
13. Lift the whole Picker Carriage Assembly out of the belt clamp plate and the Picker Guide **5** out of guide rail.



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Figure 8-9. Picker Carriage Arm Assembly Removal and Replacement

Replacing the Picker Carriage Arm Assembly

To replace the Picker Carriage Arm Assembly, perform the above procedure in reverse order. Refer to Figure 8-10 and observe the location of the ground strap **1** mentioned in step 12 on page 8-12.

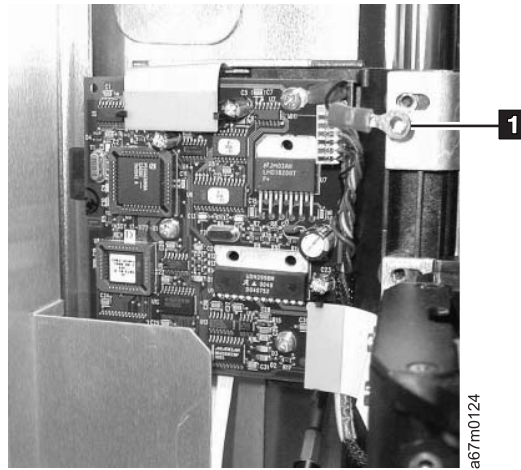


Figure 8-10. Location of ground strap

Rotary Axis Motor

For Rotary Axis Motor Part Number, see Table 15-1 on page 15-1.

See Figure 8-11 on page 8-15 and Figure 8-12 on page 8-17 for locations of components in the following procedure:

Tools that are required: *Small Phillips screwdriver, T8, T10 Torx driver, and flashlight.*

Removing the Rotary Axis Motor

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove all storage magazines from the left front storage column (column number 2). See **2** in Figure 8-26 on page 8-33 for magazine location.
5. Remove the left front storage column (column 2) for easy access to the Picker Control Board. See Figure 8-26 on page 8-33 **1** and **5** use through holes **4** to reach screws **5**.
6. See Figure 8-12 on page 8-17. Remove two T20 Torx screws **3** holding the sheet metal covering the Picker Assembly Flex Cable. Remove the sheet metal.
7. See Figure 8-12 on page 8-17. At connector **5** disconnect the Rotary Axis Motor cable **6** from the Picker Control Board. See Figure 8-11 on page 8-15 push cable **4** through the hole in casting **5**.
8. Remove all drive sleds or drive filler plates from the back of the Tape Library, refer to "Tape Drive Sled" on page 8-4. You will need this space to access the Rotary Axis Motor from the back of the Library.
9. Remove the Rotary Motor cable clamp **3** from the casting.
10. Remove the four Phillips screws **2** which attach the Rotary Axis Motor to the casting **5**, see Figure 8-11 on page 8-15. Remove the motor assembly. **Note the position of the Rotary Axis Motor and then remove the motor from the gear.**

Replacing the Rotary Axis Assembly

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

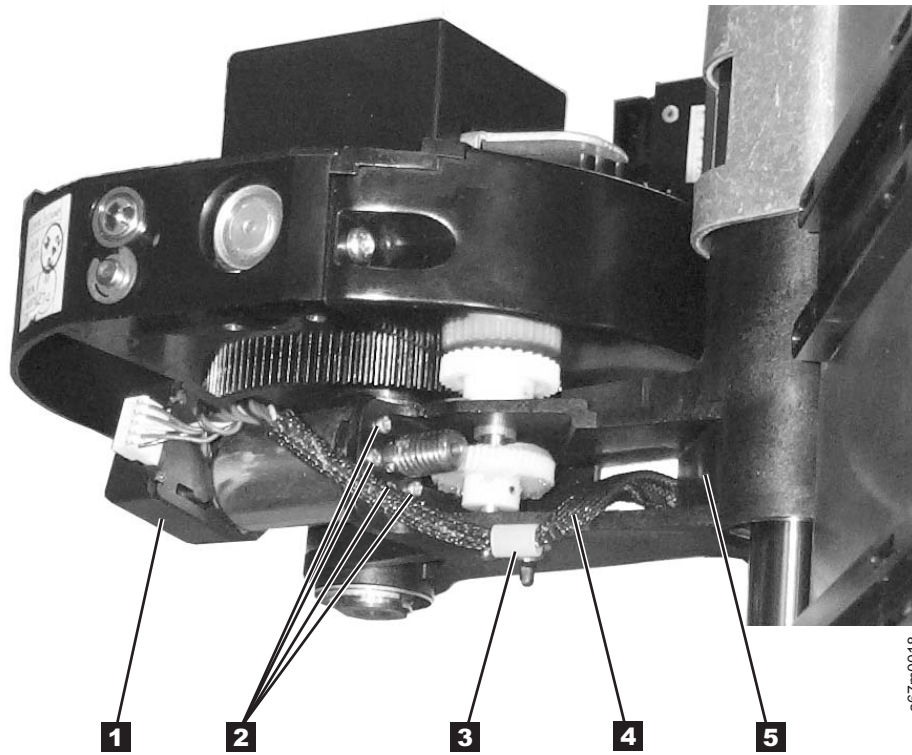


Figure 8-11. Rotary Axis Motor Removal and Replacement

Picker Control Board

For Picker Control Board Part Number, see Table 15-1 on page 15-1.

See Figure 8-12 on page 8-17 for locations of components in the following procedure:

Tools that are required: *Phillips screwdriver, T8, T10, T20 Torx drivers, 7/16 in. nut driver or open end wrench, and flashlight.*

Removing the Picker Control Board

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.

Note: You may need to move Picker Assembly up and down to create enough clearance for the next two steps.

4. Remove all storage magazines from the left front storage column (column number two). See **2** in Figure 8-26 on page 8-33 for magazine location.
5. Remove the left front storage column (column 2) for easy access to the Picker Assembly. See Figure 8-26 on page 8-33 **1** and **5**. Screws **5** can be reached by using through holes **4**.
6. Remove two T20 Torx screws **3** holding the sheet metal **2** covering the Picker Assembly Flex Cable. Remove the sheet metal and position the Picker Assembly at the top of the drive shaft.
7. Disconnect all cables, **5**, **7**, and **9** from the Picker Control Board. **If a ground strap is installed (see 2 in Figure 8-7 on page 8-10), leave the strap attached to the Carriage Arm Assembly (see 3 in Figure 8-7 on page 8-10) and disconnect it from the Picker Control Board.**
8. Remove the three screws **8** attaching the Picker Control Board to the supporting plate.
9. Remove the Picker Control Board.

Replacing the Picker Control Board

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

Note: Replacement boards containing library firmware, such as the Picker Control Board, may come from stock with a firmware level other than the current firmware level that is in the other firmware components in the library. It is even possible that the firmware may be incompatible (non-multi-path architecture type firmware). Thus, it is very important to always check the firmware level of the library (**Main Menu** → **More** → **About** → **Details**) and update the firmware in the entire library to the **latest** level (see “Updating Firmware” on page 4-114).

For proper operation of the library, ensure that the firmware level of the replacement part matches the library firmware level of the entire library.

- Note:** Make sure that all cables and the ground strap (if present) are properly connected and seated during replacement. Note that the eyelets of the ground strap are of different sizes.

- Make sure that the connectors on the ground wire between the Picker Control PCBA and the Picker Support are connected so that they do not protrude above the Picker Support. The correct orientation of the ground wire connectors is shown in Figure 8-7 on page 8-10.

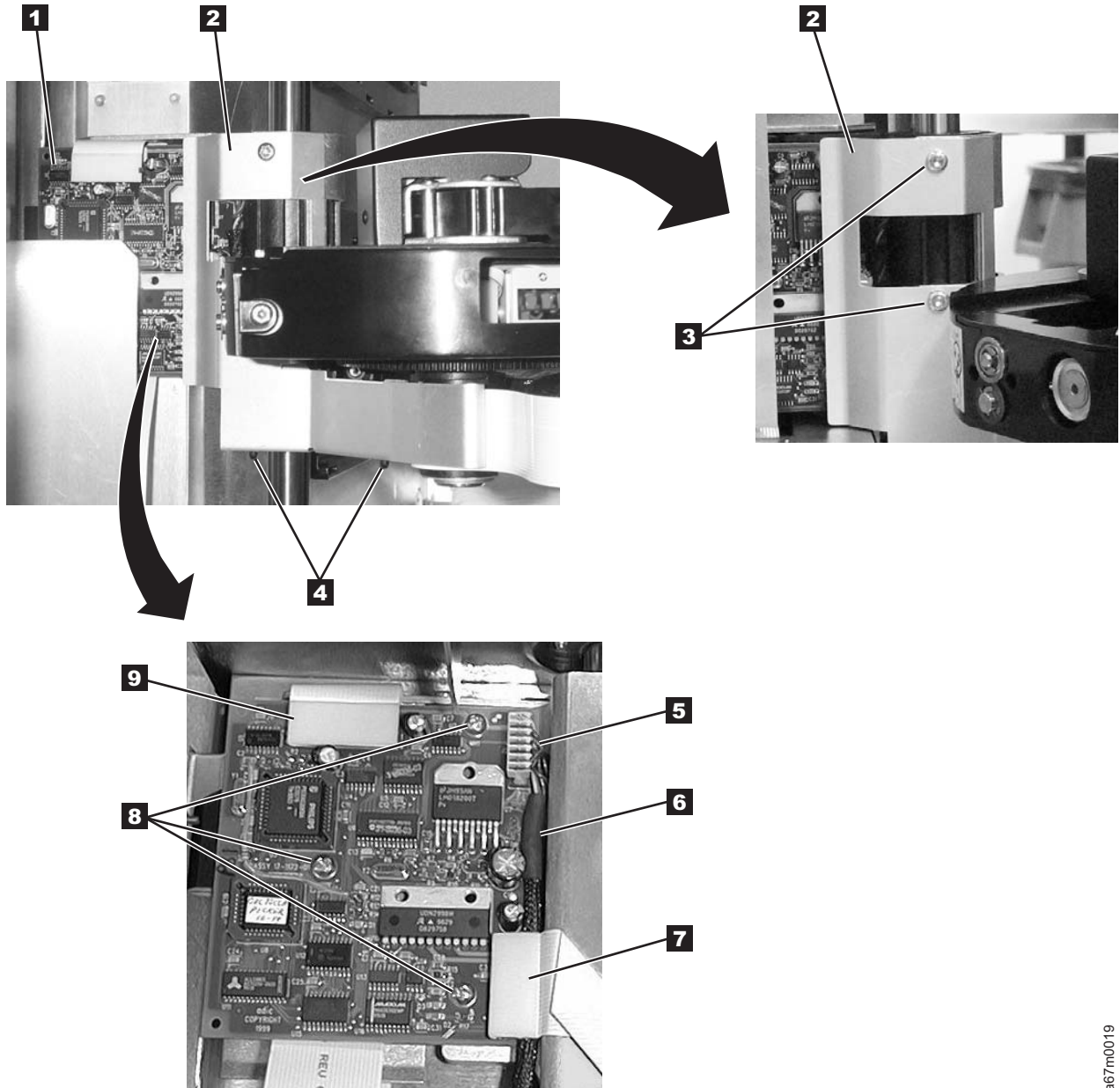


Figure 8-12. Picker Control Board Removal and Replacement

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Y-Axis Drive Belt

Notes:

1. For Y-Axis drive belt Part Number, see Table 15-1 on page 15-1.
2. **Tools that are required:** *Small Phillips screwdriver, T10 and T20 Torx drivers, 11/32 in. and 3/16 in. nut drivers, and flashlight.*

Removing the Y-Axis Drive Belt

When Tape Library is installed in a rack, you must remove Library from the rack before continuing with this procedure.

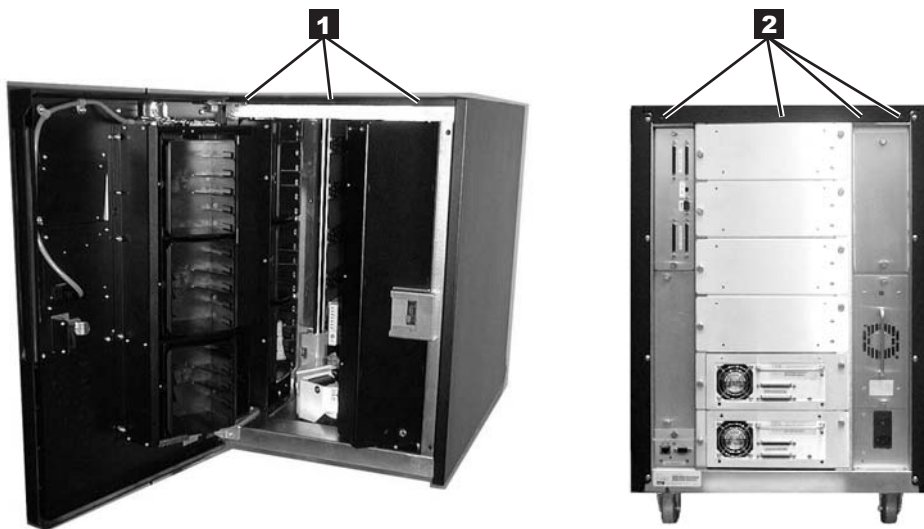
Attention: All drives and dc power supplies must be removed before Library is removed from rack. Because of the Library weight you will need three people to lift the Library out of the rack after the drives and dc power supplies are removed.



CAUTION:

The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons and/or a lifting device to safely lift this part or unit.(C011)

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. You will need to remove storage column 2 (left front) and storage column 5 (right front) if present. To do this see procedure remove the "Storage Columns" on page 8-32.
4. Remove all Drive Sleds and/or blank panels. Note position of drives so each drive will be inserted in exactly the same position during replace procedure.
5. Perform Procedure Remove the "Power Distribution Board" on page 8-49.
6. If Library is in a rack, remove library from rack now.
7. See Figure 8-13. Remove the top cover being held to the chassis with three Phillips screws **1** in front and four T10 Torx screws **2** in back. Newer models will have all seven screws Phillips head.



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Figure 8-13. Top Cover Removal. Figure shows converted library.

8. Position the Picker Assembly approximately half way between top and bottom chassis.

9. Remove the three Phillips screws attaching the drive shaft to the top of the chassis (See Figure 8-25 on page 8-31 **1**). From the front of the Library, unscrew the drive shaft counterclockwise out of the chassis bottom.

See Figure 8-14 for step 10 through step 13:

10. Slide the Drive Shaft **2** up and out of Picker casting and on out through the top of library. Put the shaft aside where it will not be nicked or scratched.
11. Disconnect the Y-Axis Flex Cable **6** from the Picker Control Board.
12. Remove the T20 Torx screw **1** which hold the Picker Assembly casting **3** and Picker Board to the belt clamp plate.
13. Lift the whole Picker Assembly casting out of the belt clamp plate and the Picker Guide **5** out of guide rail.

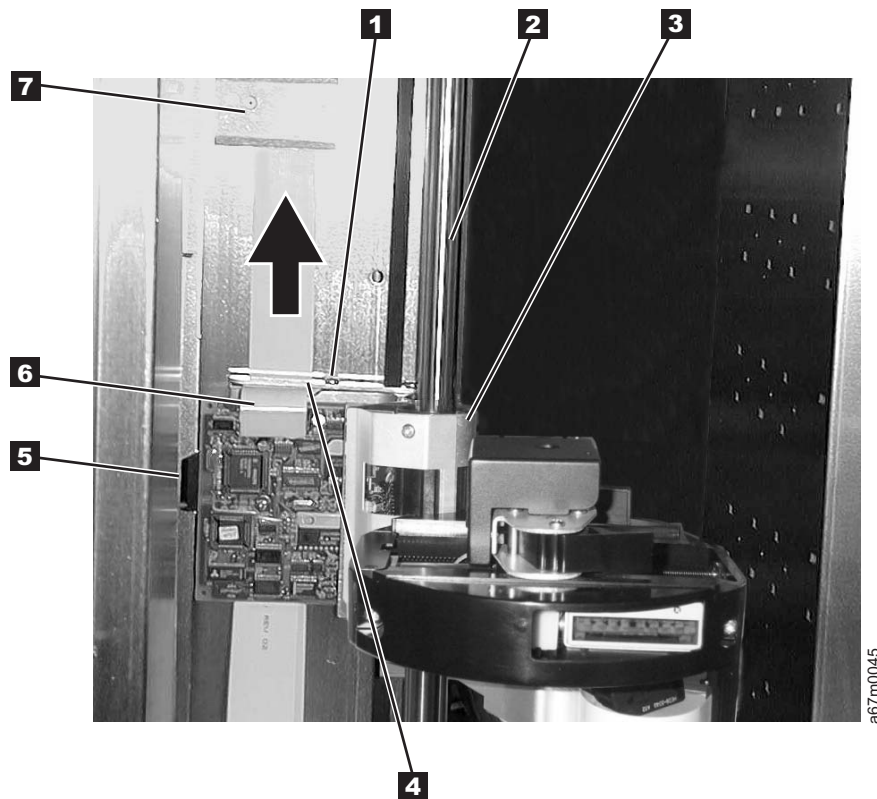


Figure 8-14. Y-Axis Drive Belt Removal and Replacement

14. See Figure 8-15 on page 8-20 for this step. Pay particular attention to the clearance between two ends of the belt **5** at the belt clamps before proceeding. You will need to maintain same clearance between ends of the new belt. The plastic belt retainer **7** behind belt clamps **3** can fall off when you remove the four belt clamp nuts. Be careful to save these belt clamps and retainer which will be needed to maintain alignment of the new belt when installed. Remove four belt clamp nuts **4** by using 3/16 in. nut driver.

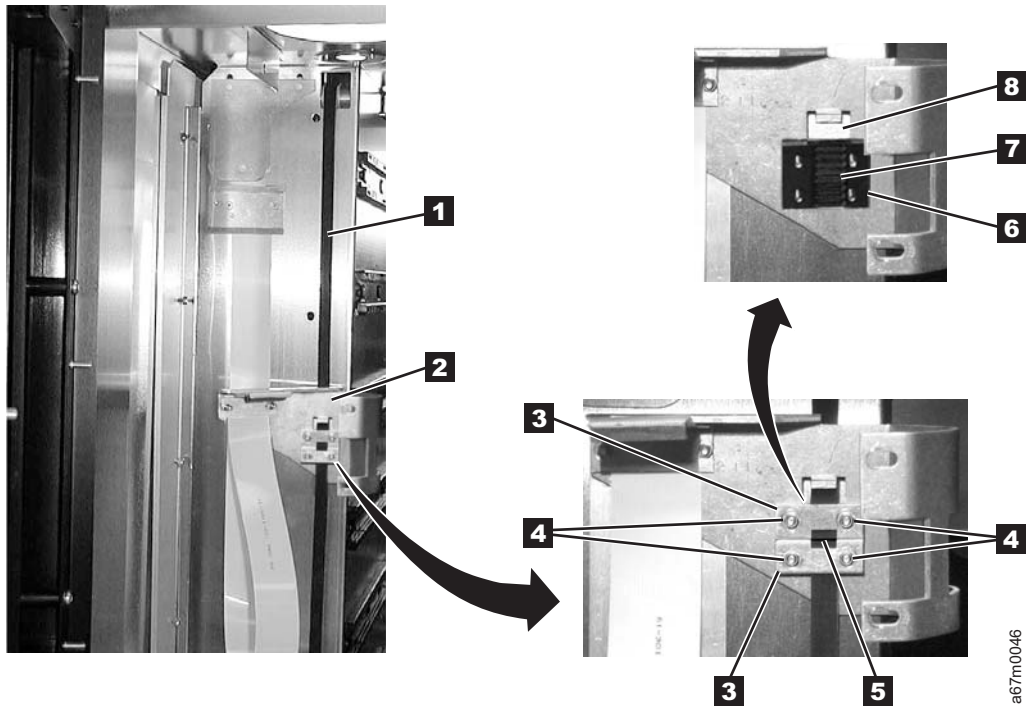


Figure 8-15. Removing the belt clamps

Step 15 through step 16 will be accomplished at rear of the Library in area where you removed the dc power supply or supplies.

15. See Figure 8-16. Loosen three Ny-lock nuts **2** (11/32 Nut driver) then loosen the tensioning screw **1** (T20 Torx driver) to release the belt tension. Do not remove the tensioning screw or Ny-lock nuts. **You may have to loosen the two Phillips screws holding the Flex Cable clamp plate **1** shown in Figure 8-19 on page 8-24 to loosen the belt tension.**

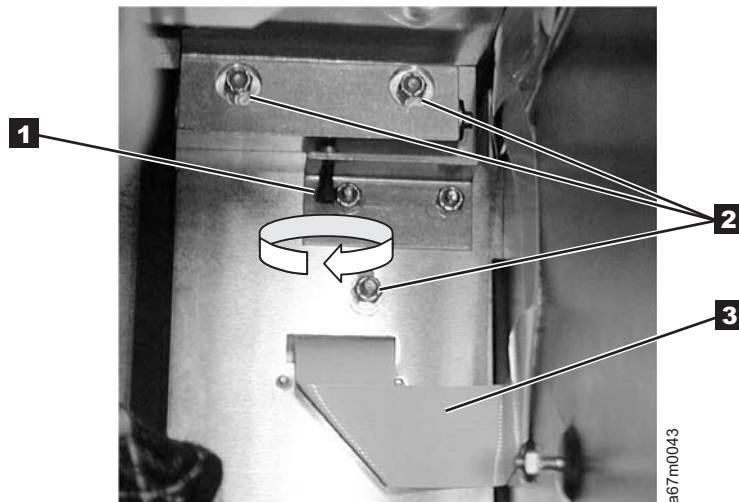


Figure 8-16. Tensioning screw and Ny-lock nuts

16. Remove the drive belt. Go to "Replacing the Y-Axis Drive Belt" on page 8-21.

Replacing the Y-Axis Drive Belt

Note: Prior to installing the new belt, ensure that it is the same length as the old belt.

1. Step 2 through step 3 are accomplished at back of library.
2. See Figure 8-17. Take new belt so teeth are away from you. Thread one end over idler pulley **4** so belt teeth mesh with idler pulley teeth. You will need to keep idler pulley from turning by using paper to act as a brake.
3. Thread the other end of the belt **1** under drive pulley. Drive pulley **2** is located in the back at left of the Y-Axis drive motor **3**.

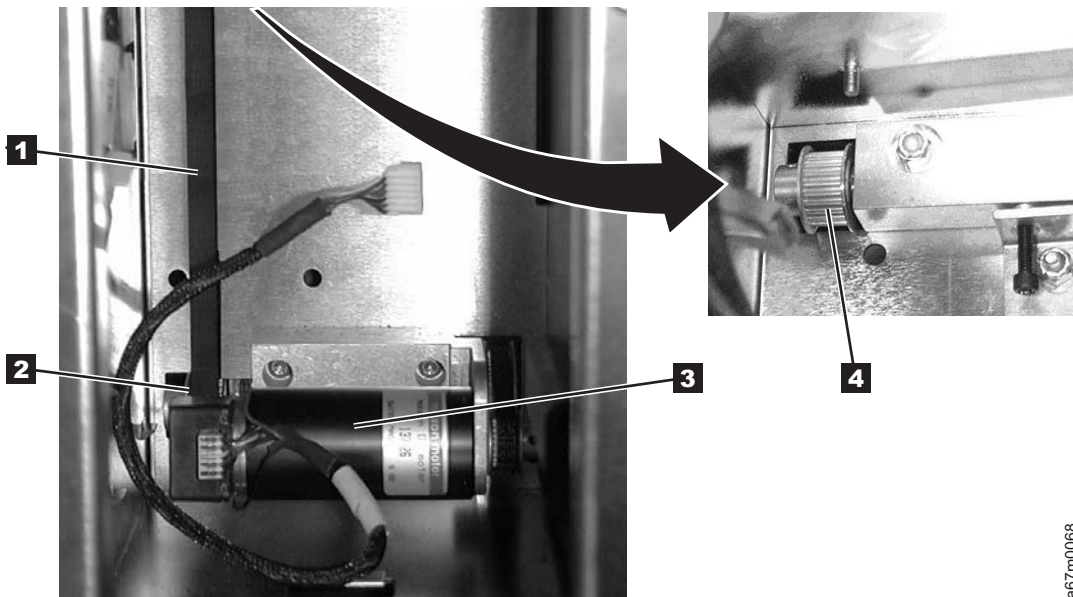


Figure 8-17. Stud and Tension pulley

4. Step 5 through 25 on page 8-23 will be done at front of the Library.
5. See Figure 8-18 on page 8-22. Find the ends of the Y-axis drive belt at top and bottom of the retaining wall. Bring the top end of belt down behind belt clamp plate **2** and through slot **8** in the belt clamp plate.
6. Retrieve plastic belt retainer **7** and clamps **3**.
7. Bring top belt end down over upper part of plastic belt retainer. Install upper belt clamp **3** but do not install nuts. With belt clamp held in place align belt end with bottom of upper belt clamp. Now install two of the 3/16 in. nuts and tighten to hold upper part of belt.
8. Now retrieve lower belt end and bring it up to lower part of plastic belt retainer **7**.
9. Ensure lower belt end is within 1/16 in. **5** of top end of belt at plastic belt retainer **7**.
10. Install lower belt clamp and remaining two 3/16 in. nuts **4** to retain lower portion of drive belt.

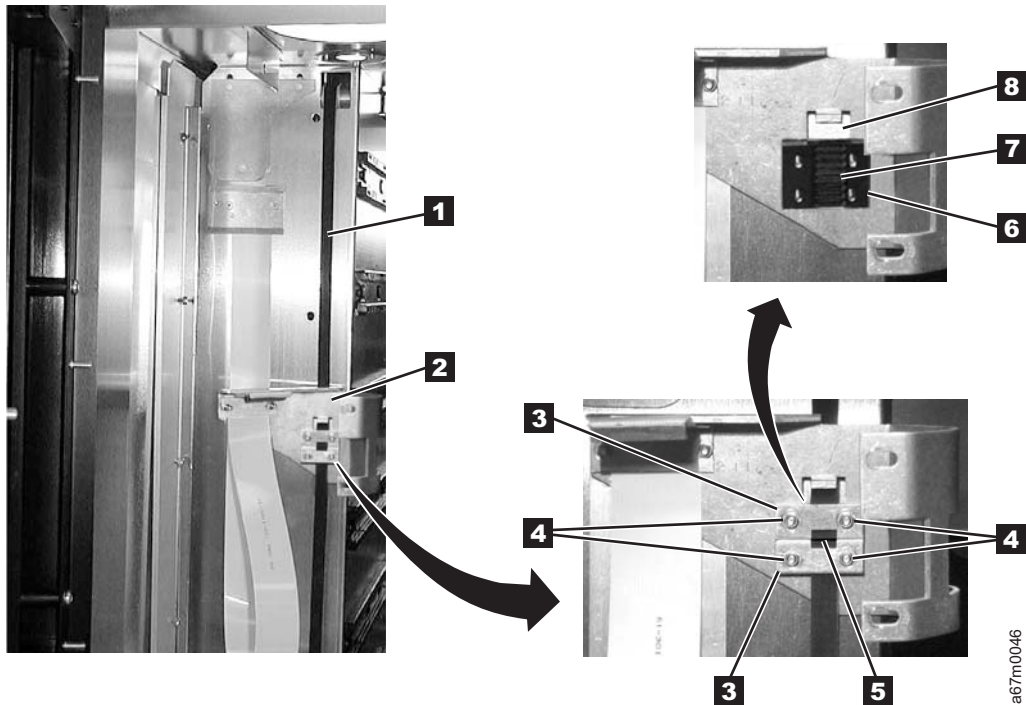


Figure 8-18. Installing Belt Clamps

11. See Figure 8-14 on page 8-19 for next three steps. Fasten the Picker Assembly Casting to the belt clamp plate using two T20 Torx screws **1** removed in step 13 on page 8-19. Ensure the Picker Guide **5** is properly installed on Picker Guide Rail.
12. Connect the Y-Axis Flex Cable **6** to the Picker Control Board being careful to align cable connector with connector pins on the Control Board.
13. Slide the Drive Shaft **2** down through the top of library and through the Picker casting. Screw shaft to stud in chassis bottom by turning shaft clockwise.
14. See Figure 8-25 on page 8-31. Attach the drive shaft to the top of the chassis with three Phillips screws that were **1** removed in step 9 on page 8-19.
15. See Figure 8-13 on page 8-18. Attach top cover to the chassis with three Phillips screws **1** in front and four T10 Torx screws **2** in back.
16. See Figure 8-16 on page 8-20. If you tightened three Ny-lock nuts **2** after releasing the tension in step 15 on page 8-20, proceed with step 17. If you did not tighten three Ny-lock nuts go to step 18.
17. Loosen three Ny-lock nuts **2** using 11/32 in. nut driver.
18. The Y–Axis motor must be plugged into the Power Distribution Board for the next step. The Power Distribution Board provides a load for the motor which acts as a generator when no power is applied. The Power Distribution Board will be turned with its edge facing you so the sockets for cables are facing left. The socket for Y–Axis motor is at the bottom. Tilt the card so its upper edge is away from you and place it into the area where it will normally reside. Insert Y–Axis motor plug into its socket.
19. Adjust the tension screw **1** clockwise (T20 Torx driver) to increase belt tension. Belt tension is properly adjusted when Picker Assembly takes approximately two seconds to drift from top of chassis to bottom of chassis. Check Picker Assembly for full travel. Picker Assembly casting should touch top of chassis and bottom of chassis at upper and lower extremes of travel. Tighten the three Ny-lock nuts **2** when tension is properly adjusted. **If you loosened the two Phillips screws holding the Flex Cable clamp plate **1**, see Figure 8-19 on page 8-24 tighten them now.** If you were sent here from another procedure to do this step return to that procedure now.
20. If you removed library from rack, reinstall library in the rack now.
21. Perform Procedure, replace the “Power Distribution Board” on page 8-49.
22. Replace all Drive Sleds and/or blank panels. Insert each drive sled in the same position as you noted during remove procedure.
23. Perform procedure “Replacing the Storage Column” on page 8-32.

24. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position.
For switch location see Figure 8-43 on page 8-53.
25. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

Y-Axis Flex Cable

For Y-Axis flex cable Part Number see Table 15-1 on page 15-1.

See Figure 8-19 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver, T8, T10 and T20 Torx drivers and flashlight.*

Removing the Y-Axis Flex Cable

1. Perform Step 1 on page 8-11 through Step 11 on page 8-19 of Procedure “Removing the Y-Axis Drive Belt” on page 8-18.
2. Remove the two Cable Clamp Plates **1**, see Figure 8-19.
3. Push the Y-Axis Flex Cable **2** to the back of the Library via the opening vacated by the Cable Clamp Plate.
4. Remove the Y-Axis Flex Cable from the cable clamps.
5. Perform Procedure Remove the Main Controller Board (refer to “Removing the Main Controller Board” on page 8-34) and disconnect the Y-axis Flex cable from the Main Controller Board.
6. From the back of the Library, slide the cable through the cable channel and remove it.

Replacing the Y-Axis Flex Cable

1. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold replacement cable by using fold marks on new cable and the old cable as a template.**
2. Perform “Removing the Y-Axis Flex Cable” in reverse order.
3. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 8-21 step 18 on page 8-22. Return here after belt tension is properly adjusted.
4. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 8-43 on page 8-53.
5. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS.*

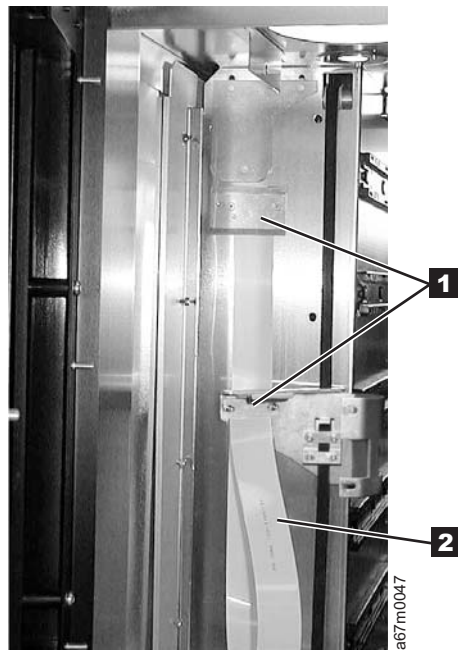


Figure 8-19. Y-Axis Flex Cable Removal and Replacement

Display Assembly Flex Cable

For Display Assembly Flex Cable Part Number see Table 15-1 on page 15-1.
See Figure 8-20 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver, T8, T10 and T20 Torx drivers and flashlight.*

Removing the Display Assembly Flex Cable

Perform Step 1 on page 8-11 through Step 12 on page 8-19 of Procedure “Removing the Y-Axis Drive Belt” on page 8-18.

1. See Figure 8-20, remove the four screws **2** attaching the Cable cover **1** to the chassis.
2. Remove the display assembly flex cable from all the cable clamps.
3. See Figure 8-49 on page 8-60, remove four screws **2** and remove Lower Grill **3** from the Door assembly.

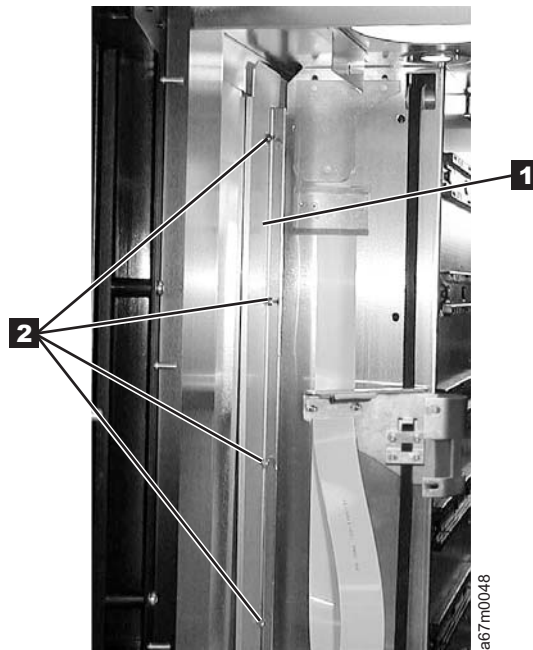
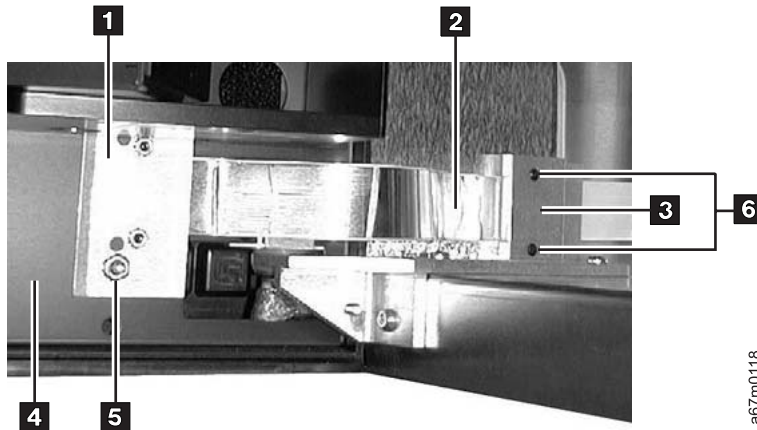


Figure 8-20. Display Assembly Flex Cable Removal and Replacement

4. Refer to Figure 8-21 on page 8-26 and remove the Display Assembly Flex Cable from the cable clamps.



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Figure 8-21. Display Assembly Flex Cable Removal and Replacement. The view is from the bottom front of the library, at the juncture of the door and the library.

5. Perform Procedure Remove the Main Controller Board (refer to “Removing the Main Controller Board” on page 8-34) and disconnect the Display Flex cable from the Main Controller Board.
6. From the back of the Library, slide the cable through the cable channel and remove it.

Replacing the Display Assembly Flex Cable

1. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold replacement cable by using new cable fold marks and the old cable as a template.**
2. Perform the above procedure in reverse order.
3. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 8-21 step 18 on page 8-22. Return here after belt tension is properly adjusted.
4. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 8-43 on page 8-53.
5. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS..*

Main Controller to Power Distribution Cables (Power or Signal Interface)

There are two cables between the Main Controller Board and the Power Distribution Board. One carries power distribution and the other provides the signal interface. For Part Numbers, see Table 15-1 on page 15-1.

Tools that are required: *Phillips screwdriver, T10, T20 Torx drivers and flashlight.*

Removing the Main to Power Distribution Cables

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 8-54.
4. Perform Procedure Remove the “ac Input Power Module” on page 8-53.
5. Disconnect the failing cable (either Power **6** or Signal **5** Interface) from the Power Distribution Board. (See Figure 8-22).
6. Disconnect all SCSI cables at the Library Host Interface Board (SCSI).
7. Loosen the two captive screws on the Host Interface Board (SCSI). (See Figure 8-37 on page 8-45 **1**), then remove the Host Interface Board (SCSI) from the Main Controller Board.
8. (See Figure 8-27 on page 8-35). Remove the T8 Torx screw **2** holding the Main Controller Board to the Library chassis. Now slide the Main Controller Board partially out of the guiding tracks **3**.
9. (See Figure 8-22), disconnect failing cable, (Power **2** or Signal **1**), from Main Controller Board.
10. Slide cable through the cable channel and remove it.

Replacing the Main to Power Distribution Cables

Perform the above procedure in reverse order. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold the replacement cable by using the fold marks and the old cable as a template.** Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

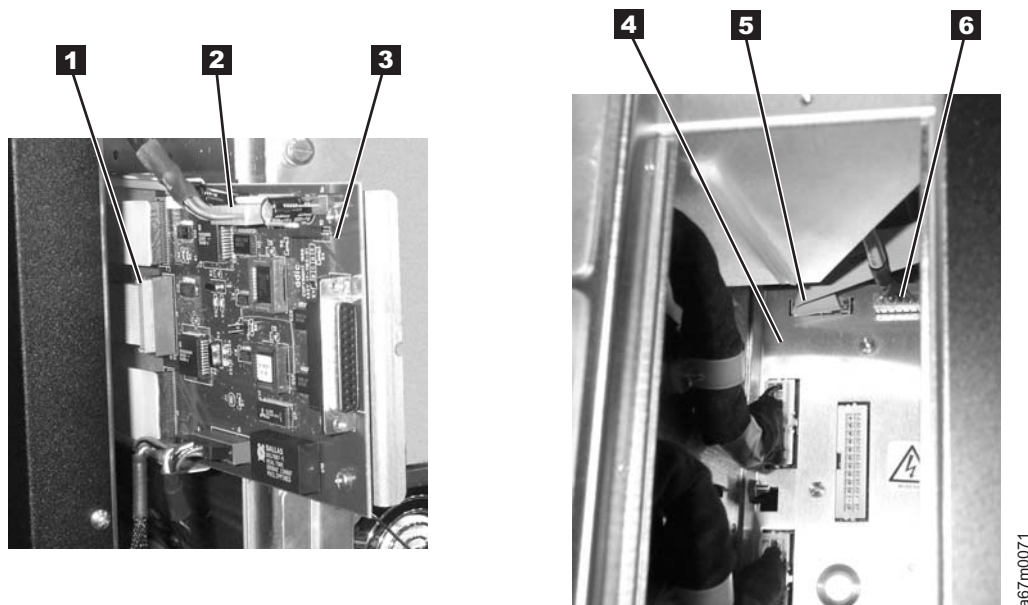


Figure 8-22. Main to Power Distribution Cables Removal and Replacement

Power Distribution to Drive Sled Cable

There are six cables between the Power Distribution Board and the six Drive Sleds, each one can be replaced independently of the others. For cable part numbers see Table 15-1 on page 15-1.

See Figure 8-23 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver, T8 Torx driver and flashlight.*

Removing the Power Distribution to Drive Sled Cable

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Remove the Drive Sled associated with the failing cable. See Procedure Remove the “Tape Drive Sled” on page 8-4.
4. Remove all dc Power Supplies or Power Supply Filler Plate, see “Removing the dc Power Supply” on page 8-55.
5. Perform Procedure Remove the “ac Input Power Module” on page 8-53.
6. See Figure 8-23 for step 6 through step 9. Disconnect the failing cable **2** from the Power Distribution Board.
7. Remove the cable clamp **3** from the chassis.
8. Remove the Phillips screw and Torx screw **1** and **4**.
9. Push the connector and its bracket through the hole and remove the cable.

Replacing the Power Distribution to Drive Sled Cable

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

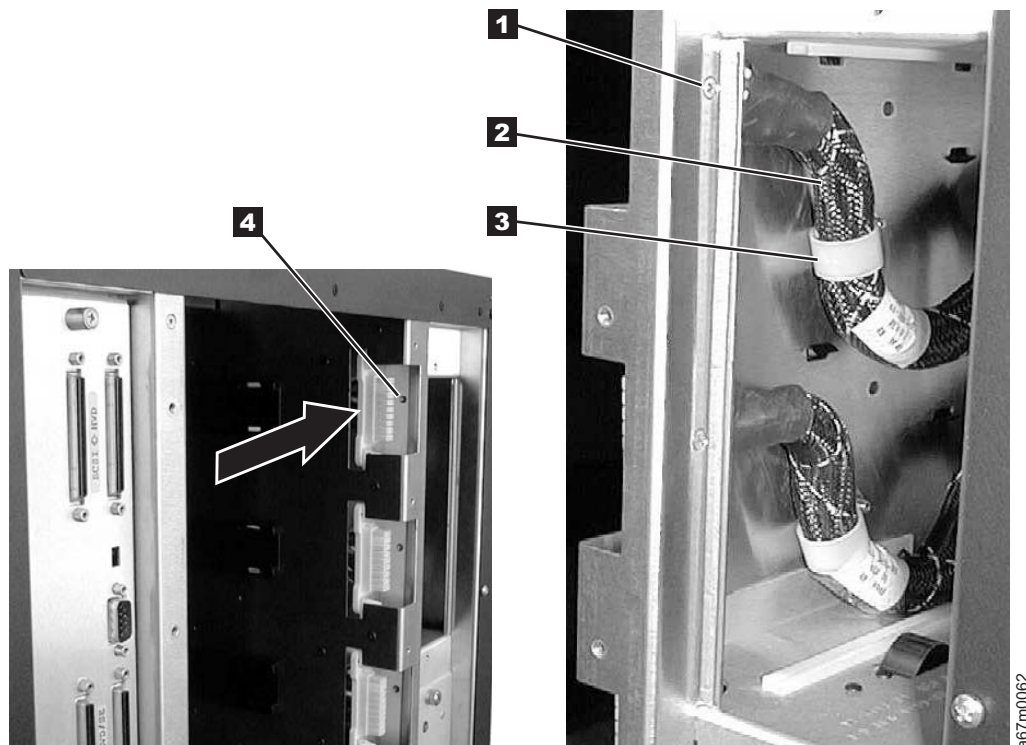


Figure 8-23. Power Distribution to Drive Sled Cable Removal and Replacement

Y-Axis Motor Assembly

For Y-Axis motor part number, see Table 15-1 on page 15-1.

See Figure 8-24 on page 8-30 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver, 11/32 in. Nut driver, T10 & T20 Torx drivers and flashlight.*

Removing the Y-Axis Motor Assembly

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 8-54.
4. Perform Procedure Remove the “ac Input Power Module” on page 8-53.
5. Perform Procedure Remove the “Power Distribution Board” on page 8-49.
6. Use **Figure 8-16 on page 8-20**, loosen the three Ny-lock nuts **2** (11/32 in. Nut driver) then loosen the tensioning screw **1** clockwise (T20 Torx driver) to release the belt tension. Do not remove the screws. **You may have to loosen the two Phillips screws holding the Flex Cable clamp plate, see Figure 8-14 on page 8-19 to loosen the belt tension.**
7. Remove the two screws **3** attaching the Y-Axis motor assembly to the chassis.

Note: A long shaft T20 Torx screw driver may be required.

8. Remove the motor Assembly **2** from the belt.

Replacing the Y-Axis Motor Assembly

1. Perform the above procedure in reverse order.
2. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 8-21 step 18 on page 8-22. Return here after belt tension is properly adjusted.
3. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 8-43 on page 8-53.
4. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*..

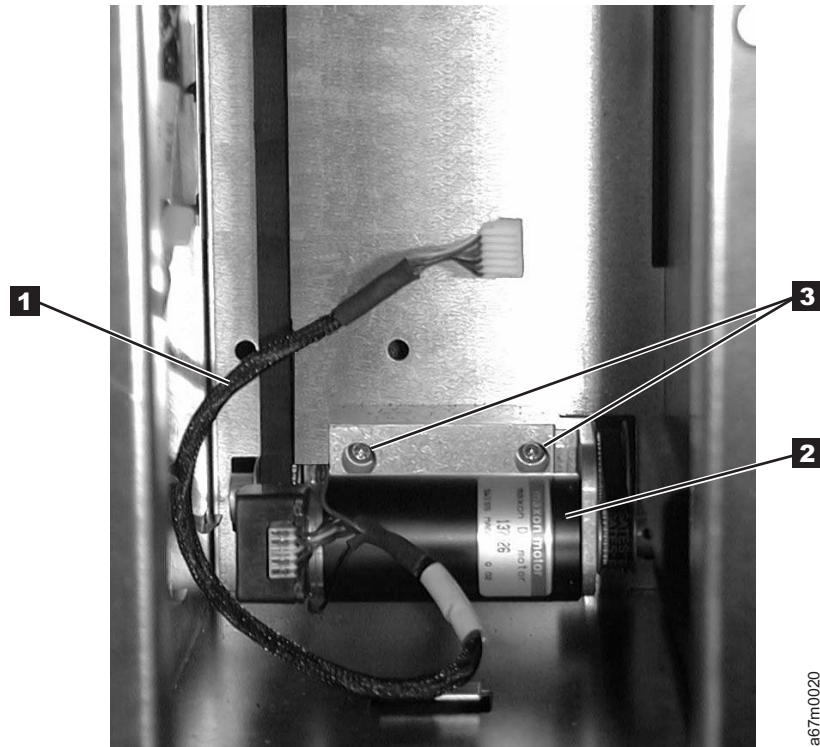


Figure 8-24. Y-Axis Motor Assembly Removal and Replacement

Y-Axis Drive Shaft Assembly

Note: If the library is installed in a rack, you must slide it out prior to performing this procedure. See Figure 8-25 on page 8-31 for locations of components in this procedure.

Tools that are required: *Phillips screwdriver, T10 Torx driver.*

Removing the Vertical Axis Drive Shaft

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library and remove storage column two (left front). See Procedure Remove the “Storage Columns” on page 8-32.
4. Remove the top cover. The top cover is attached to the chassis with three Phillips screws on the front and four T10 Torx screws in the back.
5. Remove the three Phillips screws **1** attaching the drive shaft to the top of the chassis. From the front of the Library, unscrew the drive shaft **2** counterclockwise out of the chassis bottom.
6. Lift the Drive Shaft **2** out of the Picker Assembly casting and remove the Drive shaft through the top of the chassis.

Replacing the Vertical Axis Drive Shaft Assembly

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

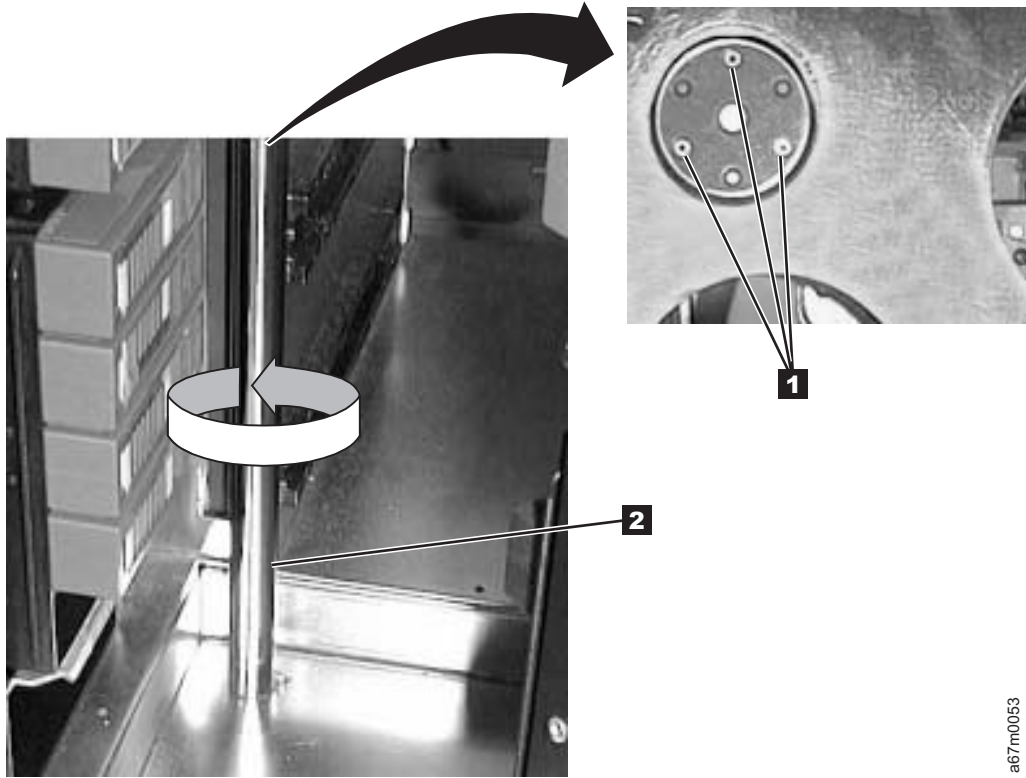


Figure 8-25. Y-Axis Drive Shaft Removal and Replacement

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Storage Columns

For Storage Columns Part Number, see Table 15-1 on page 15-1.

See Figure 8-26 on page 8-33 for locations of components in the following procedure.

Tools that are required: 11-mm or 7/16-in. Nut driver, allen wrench or T20 Torx and flashlight.

Removing the Storage Column

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Note magazine positions so you can return each magazine to the same position. Remove all storage magazines **2** from the column you wish to remove. In order to remove the bottom tape magazines, you will have to manually raise the picker robotic system out of the way.
5. Remove the top bolt **1** by using the 7/16 in. Nut driver.
6. Perform one of the following two steps depending on the column you are removing:
 - a. Remove columns **2** or **4**, using Torx or allen wrench to remove two bottom screws **5**. These two screws can be reached by using the through holes **4**.
 - b. If you are removing column **5**, use the 7/16 in. nut driver to remove the bolt **3** attaching the storage column to the bracket.
7. If necessary, move the picker assembly to a position in the vertical axis to allow access to the storage column. Gently slide the storage column out of the library front door. **See Figure 7-7 on page 7-8. It may be easier to remove the storage column 2 if the bar code reader cover 4 is removed from the Picker Assembly.**

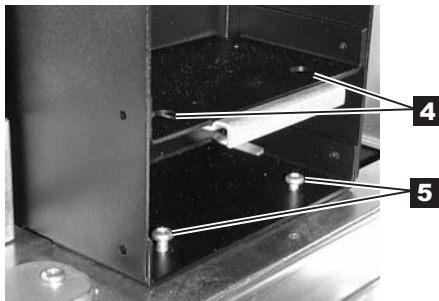
Replacing the Storage Column

See Table 15-1 on page 15-1 for the correct Part Number. Perform the above procedure in reverse order.

Make sure that you install the storage column in front of the mounting bracket of the library (see top picture in Figure 8-26 on page 8-33). Replace magazines in same positions as noted in step 4. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*. **Be sure to reteach and reinventory the Library by using the Operator Panel if these options are not set automatically.**



Top Attachment for all Storage Columns



Bottom Attachment for Storage Columns 2 and 4



Bottom Attachment for Storage Column 5

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Figure 8-26. Storage Removal and Replacement

Main Controller Board

Note: Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the same operation. Instead, exchange one card and determine whether the problem still exists. If so, reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all configuration settings and library VPD.

For Main Controller Board Part Number, see Table 15-1 on page 15-1.

See Figure 8-27 on page 8-35 for locations of components in the following procedure.

Before doing the following remove procedure, if possible, retrieve all Tape Library Subsystem configuration data such as SCSI ID. Using the Setup option on operator panel (Main Menu → Setup → Library).

Tools that are required: *Phillips screwdriver, T8 Torx driver and flashlight.*

Removing the Main Controller Board

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Loosen the two captive screws on the Serial Diagnostic Port Board (or Host SCSI Interface Board in a converted library), (See Figure 8-37 on page 8-45 **1**), then remove the Host SCSI Interface Board from the Main Board.
4. (See Figure 8-27 on page 8-35). Remove the T8 Torx screw **2** holding the Main Controller Board to the Library chassis. Now slide the Main Controller Board partially out of the guiding tracks **3**.
5. Disconnect all cables from the Main Controller Board.
6. Remove the Main Controller Board and its supporting plate.

Replacing the Main Controller Board

Perform the removal steps in reverse order.

- Replacement boards containing library firmware, such as the Main Controller Board, may come from stock with a firmware level other than the current firmware level that is in the other firmware components in the library. It is even possible that the firmware may be incompatible (non-multi-path architecture type firmware). Thus, it is very important to always check the firmware level of the library (**Main Menu → More → About → Details**) and update the firmware in the entire library to the **latest** level (see “Updating Firmware” on page 4-114).

For proper operation of the library, ensure that the firmware level of the replacement part matches the library firmware level of the entire library.

Note: The boot code of the new part does not have to match the boot code of the other parts in the library.

- For libraries with the Multi-Path feature, the library serial number to be stored on the new main controller board is determined internally by arbitration firmware because the serial number is stored in several library locations. If the arbitration firmware cannot determine the serial number through arbitration, the firmware displays the choices on the operator panel and instructs the operator to choose the correct one.
- Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

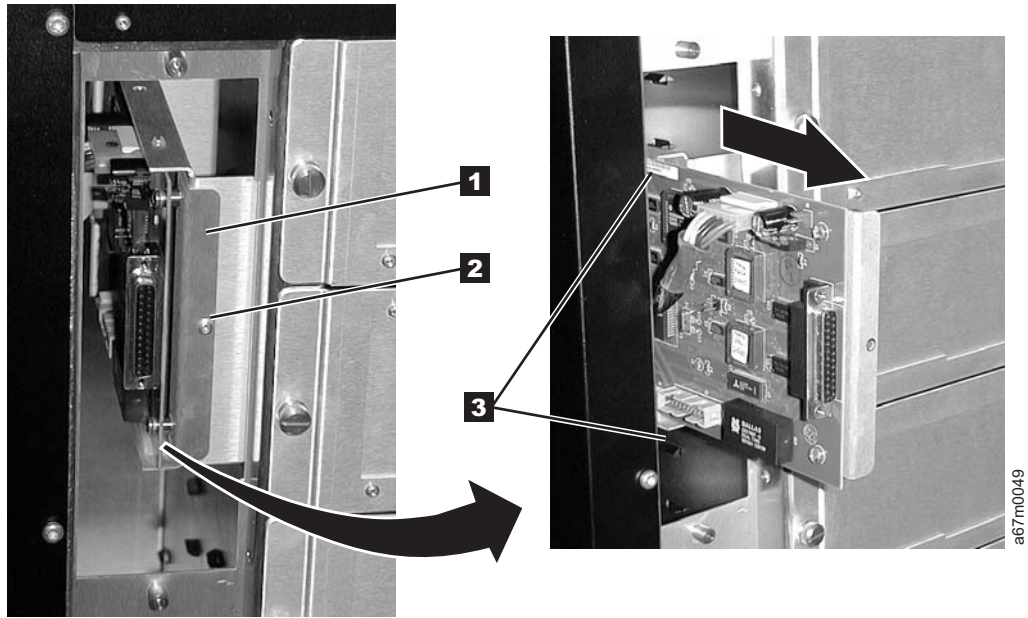


Figure 8-27. Main Board Removal and Replacement

RMU Network Interface Cable

For RMU Network Interface Cable Part Number, see Table 15-1 on page 15-1.

Tools that are required: *T8 Torx drivers and 11/32 in. nut driver.*

Removing the RMU Interface Cable

1. Perform the procedure for removing the SAN Data Gateway Module. See “SAN Data Gateway Module” on page 8-41.
2. Perform the procedure for removing the RMU. See “Remote Management Unit” on page 8-39.
3. Remove the two T8 Torx screws (**1** in Figure 8-28) that secure the Lower Fibre Channel Bracket Sub-Assembly to the chassis, then remove the bracket from the chassis.
4. Remove the 11/32 nut **2** that secures the RMU Interface Cable to the rear of the chassis.



Figure 8-28. Removing the Lower Fibre Channel Bracket Sub-Assembly

5. Remove the two T8 Torx screws (**1** in Figure 8-29) that secure the RMU Bracket Sub-Assembly to the bottom of the chassis and slide the bracket out of the chassis.
6. Remove the two T8 Torx screws **2** that secure the RMU Interface Cable connector to the RMU Bracket Sub-Assembly and disconnect the RMU Interface Cable from the RMU Bracket Sub-Assembly.

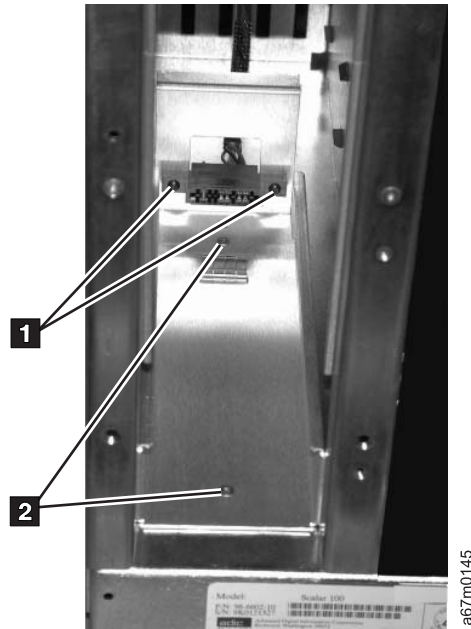


Figure 8-29. View of the RMU Bracket Sub-Assembly and RMU Interface Cable Connector

7. Remove the T8 Torx screw (**1** in Figure 8-30) holding the Main Controller PCBA to the library chassis and slide the Main Controller PCBA partly out of the guiding tracks.

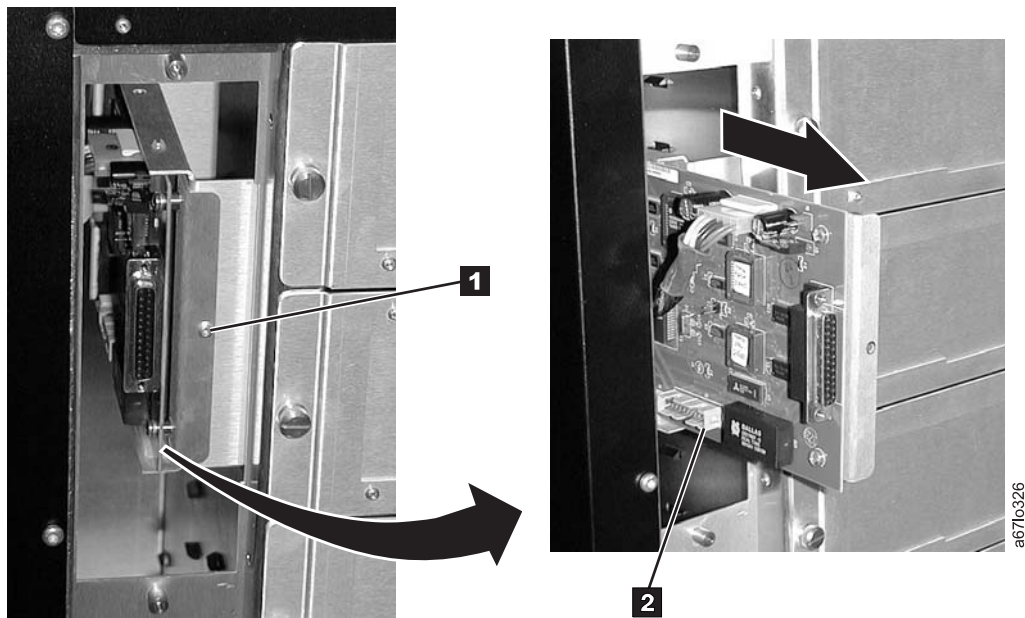


Figure 8-30. Sliding the Main Controller PCBA Out of the Guiding Tracks

8. Disconnect the RMU Interface Cable from the Main Controller PCBA and remove the RMU Interface Cable **2**.

9. Remove the cable clamp from the old RMU Interface Cable and reattach the clamp to the new RMU Interface Cable.

Replacing the RMU Interface Cable

Perform the removal steps in reverse order. **Be careful not to bend pins when connecting cables.**

Remote Management Unit

Note: Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the same operation. Instead, exchange one card and determine whether the problem still exists. If so, reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all configuration settings and library VPD.

For RMU Part Number, see Table 15-1 on page 15-1.

See Figure 8-31 for locations of components in the following procedure.

Tools that are required: *Phillips Screwdriver (0)*.

Remove RMU

1. See Figure 8-31 for RMU location in library.
2. Ensure the RMU **1** is dormant.
3. Disconnect the customer's Ethernet cable from the RMU.
4. Loosen the thumbscrew **2** on the RMU and slide unit out of library.

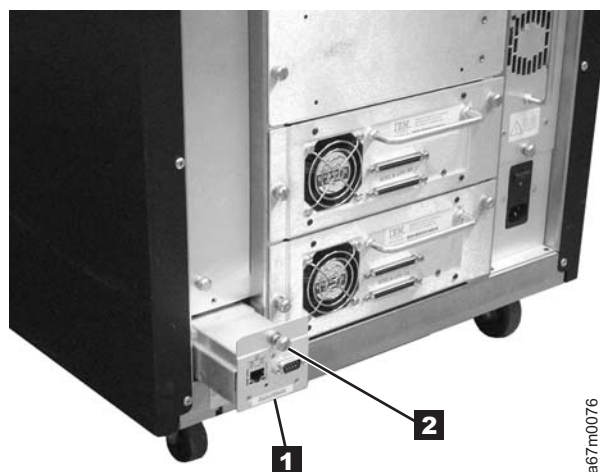
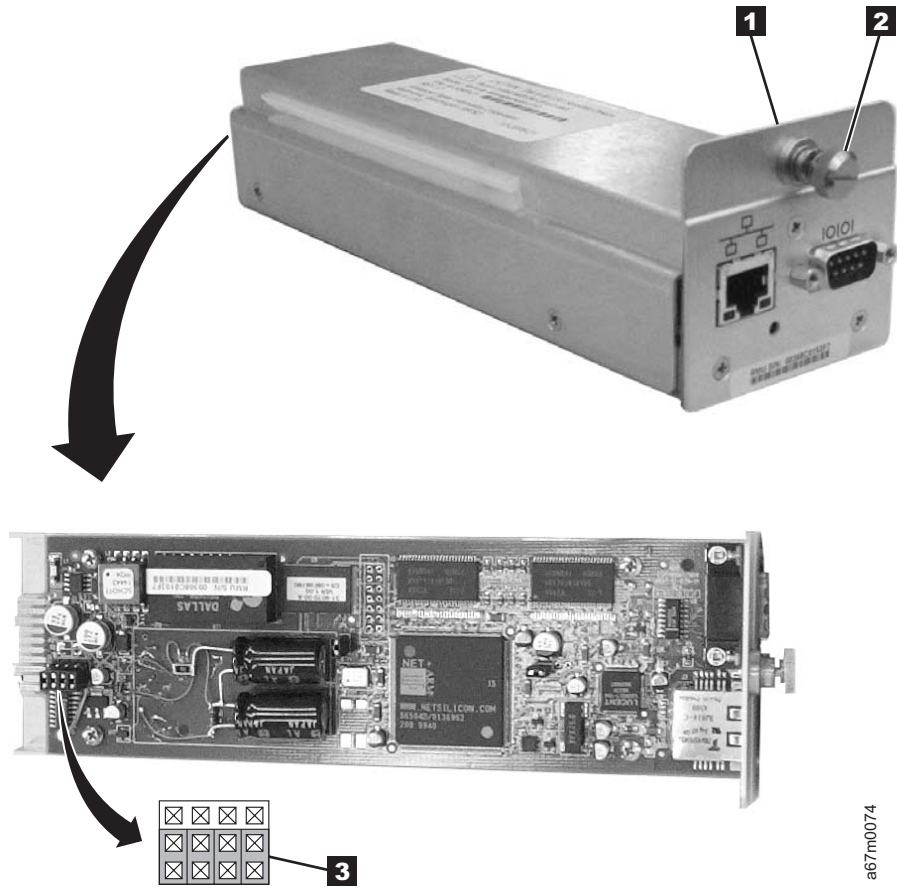


Figure 8-31. RMU

Replace RMU

1. See Figure 8-32 on page 8-40 for the next steps. Before you install the RMU in the library look into the end of the RMU and verify that the four jumpers are located as shown in detail **3**.
2. Slide the RMU **1** into the library and tighten the thumbscrew **2**.
3. Connect the network cable to RMU.
4. Ensure the RMU firmware is the latest by checking the IBM web site (<http://www.ibm.com/storage/1to>). See "Updating Firmware" on page 4-114 for updating RMU firmware.
5. Advise the customer that the RMU is available for configuration. For instructions, refer the customer to the section about configuring the RMU in the installation chapter of the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.



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Figure 8-32. RMU Jumpers

SAN Data Gateway Module

Note: Before removing or replacing the SAN Data Gateway Module, see the section about preserving the gateway's configuration in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.

For SAN Data Gateway Module Part Number, see Table 15-1 on page 15-1.
See Figure 8-33 for location of gateway in the library.

Tools that are required: *None.*

Remove SAN Data Gateway Module

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. See Figure 8-33 for steps 3 through 4. Disconnect all cables at the gateway **1**.
4. Loosen the thumbscrews **2** on the gateway and slide gateway **1** out of library.



Figure 8-33. SAN Data Gateway Module. Figure shows converted library.

Replace SAN Data Gateway Module

Note: Be careful to connect the SCSI VHDCI cables in their proper orientation to the SAN Data Gateway Module.

Perform steps 1 through 4 in “Remove SAN Data Gateway Module” in reverse order. Customer should refer to *Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* for configuration of gateway.

Accessory Bay Cable for the SAN Data Gateway Module

For Accessory Bay Cable Part Number, see Table 15-1 on page 15-1.

See 8-42 and 8-36 for locations of components in the following procedure.

Tools that are required: *T8 Torx drivers and 11/32 in. nut driver.*

Removing the Accessory Bay Cable for the SAN Data Gateway Module

1. Perform the procedure for removing the SAN Data Gateway Module. See “SAN Data Gateway Module” on page 8-41.
2. Perform the procedure for removing the Main Controller PCBA. See “Main Controller Board” on page 8-34.
3. Perform the procedure for removing the dc Power Supply. See “dc Power Supply” on page 8-54.
4. Remove the tape drives sleds or filler plates in locations 3 and 4. See “Tape Drive Sled” on page 8-4.
5. Remove the three T8 Torx screws (**1** in Figure 8-34) that secure the Fibre Channel Bracket Sub-Assembly **2** to the chassis and slide the bracket out of the chassis. (Two of the screws are located between the guide rails for drives 3 and 4. The third T8 Torx screw is located on the outside of the chassis.)

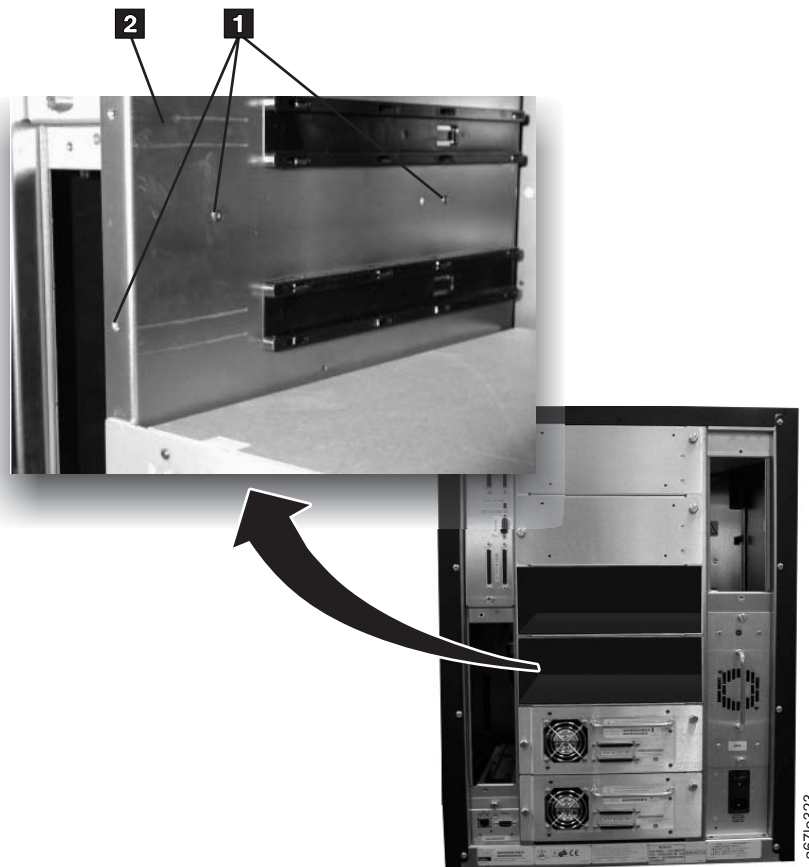


Figure 8-34. Removing the T8 Torx Screws that Secure the Fibre Channel Bracket Sub-Assembly

6. Disconnect the Accessory Bay Cable (**1** in Figure 8-35) from the Fibre Channel Bracket Sub-Assembly. If necessary, cut the cable connector locking tabs.

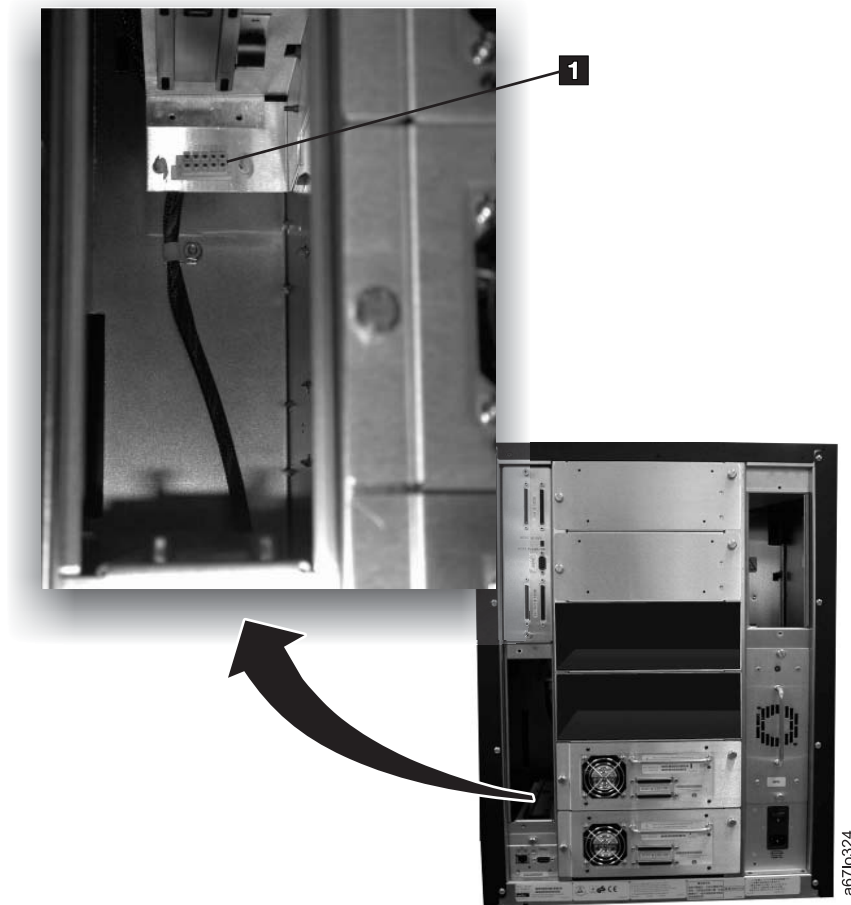


Figure 8-35. Disconnecting the accessory bay cable from the Fibre Channel bracket sub-assembly. Figure shows a converted library.

7. Disconnect the Accessory Bay Cable from the Power Distribution PCBA (**1** in Figure 8-36). Remove the Accessory Bay Cable by sliding it through the cable channel.



Figure 8-36. Disconnecting the accessory bay cable from the power distribution PCBA. Figure shows a converted library.

Replacing the Accessory Bay Cable for the SAN Data Gateway Module

Perform the removal steps in reverse order.

Note: The Accessory Bay Cable is routed behind the ribbon cables that connect to the Main Controller PCBA. Also, because alignment of the Torx screws between the guide rails for tape drive sleds 3 and 4 may be difficult when reinstalling the Fibre Channel Sub-Assembly, start the Torx screws by hand to ensure the bracket is properly fitted.

Host SCSI Interface Board

For Host SCSI Interface Board Part Number, see Table 15-1 on page 15-1.
See Figure 8-37 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver.*

Note: The Host SCSI Interface Board is a required board for a non-multi-path library. The only function of this board in a multi-path library is the serial port. If the serial port become defective, the board is to be replaced by the Serial Diagnostic Port Board (see 8-46).

Removing the Host SCSI Interface Board

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Loosen the two captive screws **1** on the Host SCSI Interface Board. Remove the Host SCSI Interface Board from the Main Board.

Replacing the Host SCSI Interface Board

Replace this board with the Serial Diagnostic Port Board (see 8-46). Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

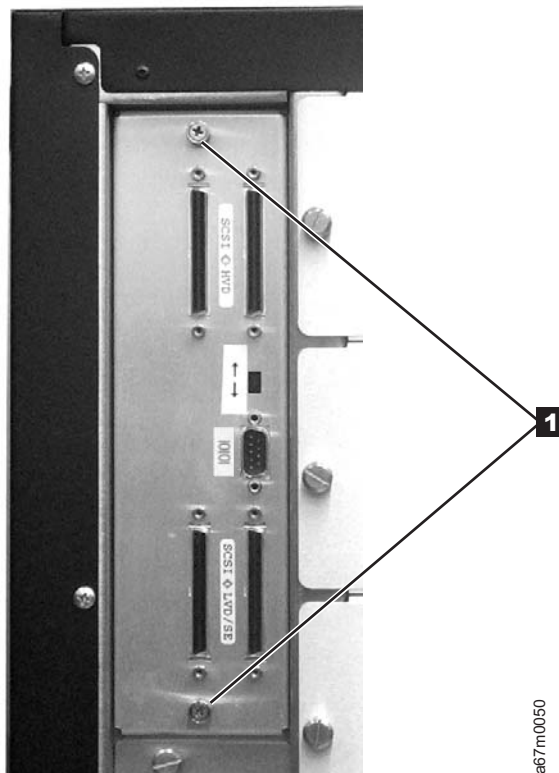


Figure 8-37. Host SCSI Interface Board. This board will be present in a converted library; however, only the serial port will be utilized.

Serial Diagnostic Port Board

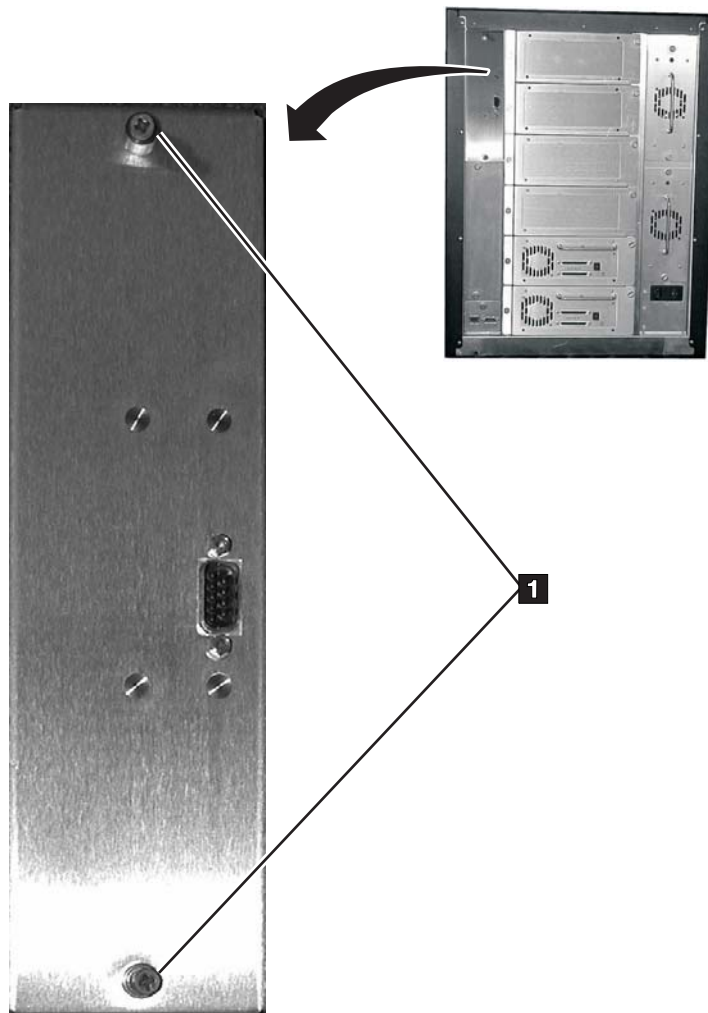
For Host SCSI Interface Board Part Number, see Table 15-1 on page 15-1.

See Figure 8-37 on page 8-45 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver.*

Removing the Serial Diagnostic Port Board

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Loosen the two captive screws **1** on the Serial Diagnostic Port Board. Remove the Serial Diagnostic Port Board from the Main Board.



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Figure 8-38. Serial Diagnostic Port Board Removal and Replacement

Replacing the Serial Diagnostic Port Board

Perform the removal steps in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

Display Assembly

Note: Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the same operation. Instead, exchange one card and determine whether the problem still exists. If so, reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all configuration settings and library VPD.

For Display Assembly Part Number, see Table 15-1 on page 15-1.

Tools that are required: *Phillips screwdriver and T8 Torx driver.*

See Figure 8-39 on page 8-48 for locations of components in the following procedure.

Removing the Display Assembly

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove the six T8 Torx screws holding the Display Assembly to the front door. Refer to **1** in Figure 8-47 on page 8-58 for locations of these screws.
5. Disconnect cables **3** and **6** from the Display Control Board. **Be careful not to bend pins when disconnecting cables.**
6. Remove the Display Assembly.

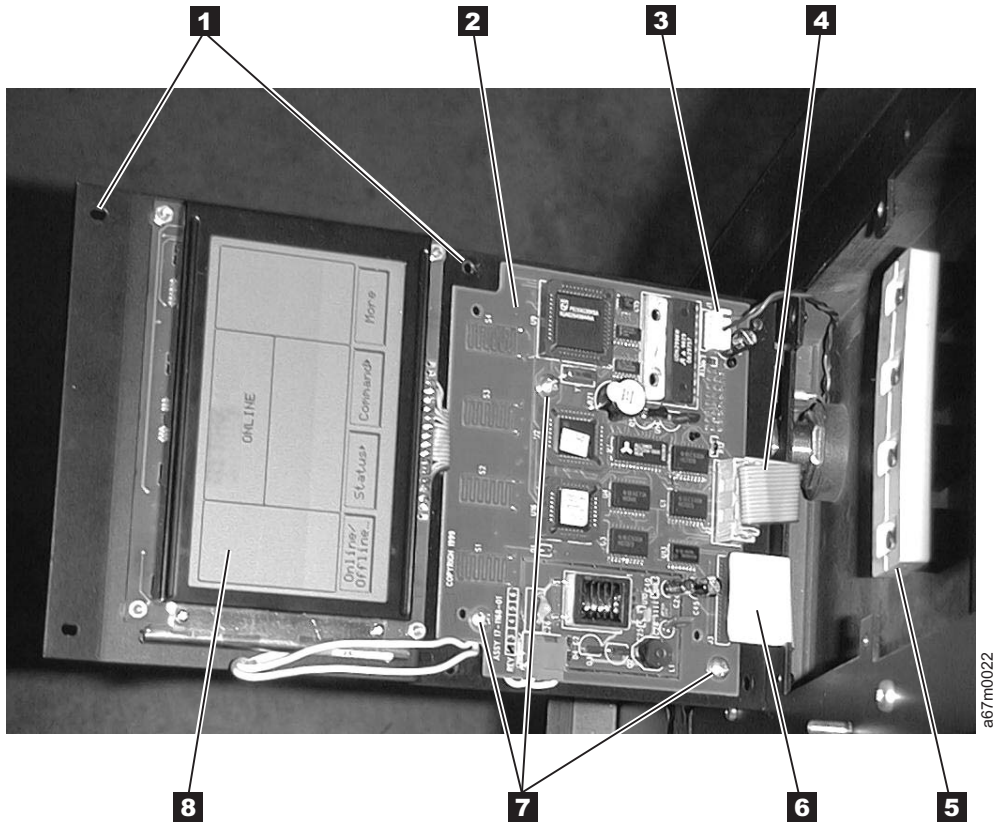
Replacing the Display Assembly

Perform the removal steps in reverse order. **Be careful not to bend pins when connecting cables.**

Note: Replacement boards containing library firmware, such as the Display Assembly, may come from stock with a firmware level other than the current firmware level that is in the other firmware components in the library. It is even possible that the firmware may be incompatible (non-multi-path architecture type firmware). Thus, it is very important to always check the firmware level of the library (**Main Menu** → **More** → **About** → **Details**) and update the firmware in the entire library to the latest level (see “Updating Firmware” on page 4-114).

For proper operation of the library, ensure that the firmware level of the replacement part matches the firmware level of the entire library.

Note: The boot code of the new part does not have to match the boot code of the other parts in the library.



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Figure 8-39. Display Assembly Removal and Replacement

Power Distribution Board

For Type II and Type I Power Distribution Board Part Numbers, see Table 15-1 on page 15-1. See Figure 8-40 on page 8-50 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver, T8 Torx driver, 11/32 in. open wrench and flashlight.*

Removing the Power Distribution Board

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 8-54.
4. Perform Procedure Remove the “ac Input Power Module” on page 8-53.
5. Remove drive sleds in positions 3, 4, and 5 to access bracket screws.
6. Remove four screws **1** then remove bracket **2**.
7. Disconnect all cables on the side of the Power Distribution Board facing you. There are:
 - a. Six Drive sled cables **8**.
 - b. Two cables from the Main Controller Board **3** (Power and Signal).
 - c. The Y-Axis Motor Assembly cable **6**.
 - d. San Appliance Module power cable (only on Type II board) **11**.
8. Using 11/32 in. wrench, remove four nuts **7** holding Power Distribution Board to chassis wall.
9. Lift Power Distribution Board out of the mounting studs **7** and rotate its right side toward you. Be persistent this is a tight fit.
10. Tilt the bottom of Board slightly toward you to remove it.
11. Remove and retain seven screws **9** holding the metal bracket **10** to board you just removed. Use screws **9** to attach bracket **10** to the Type II board.

Replacing the Power Distribution Board

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

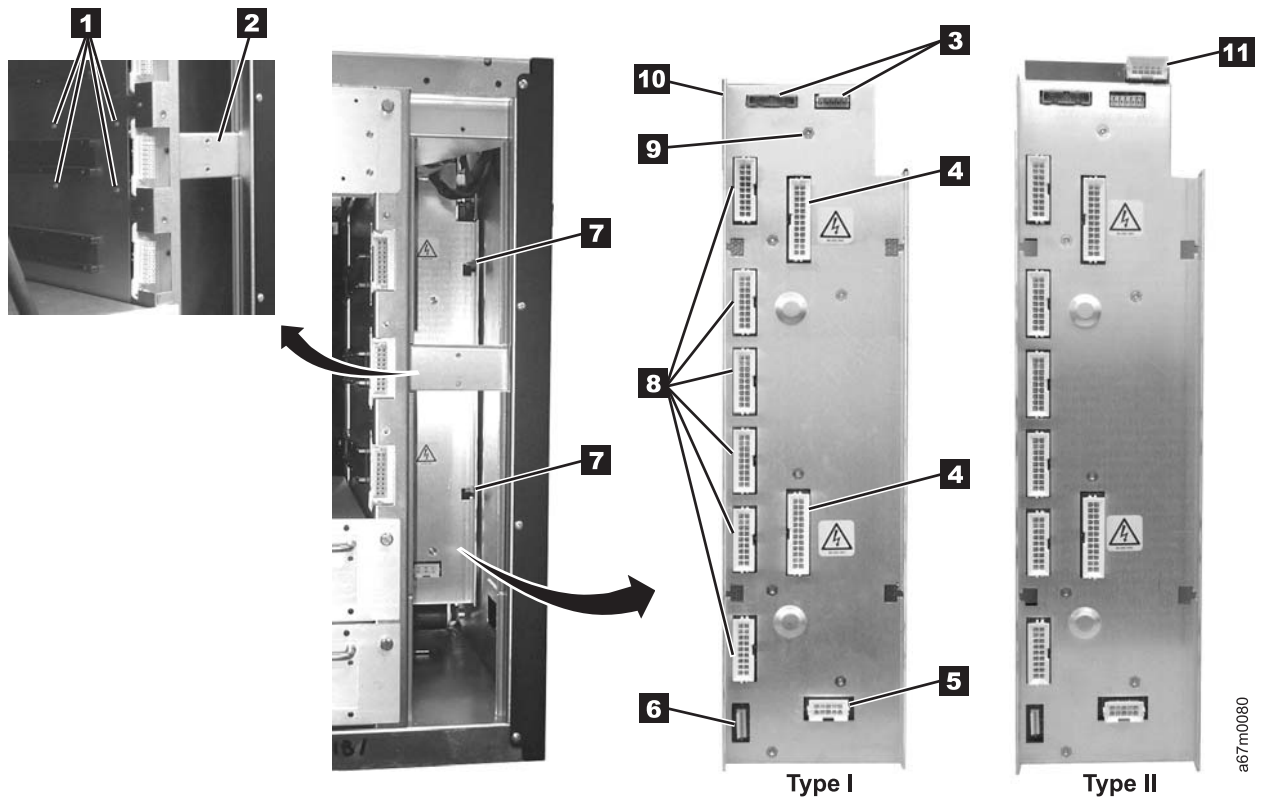


Figure 8-40. Power Distribution Board Removal and Replacement

12-Slot I/O Station

For I/O station assembly part number, see Table 15-1 on page 15-1.

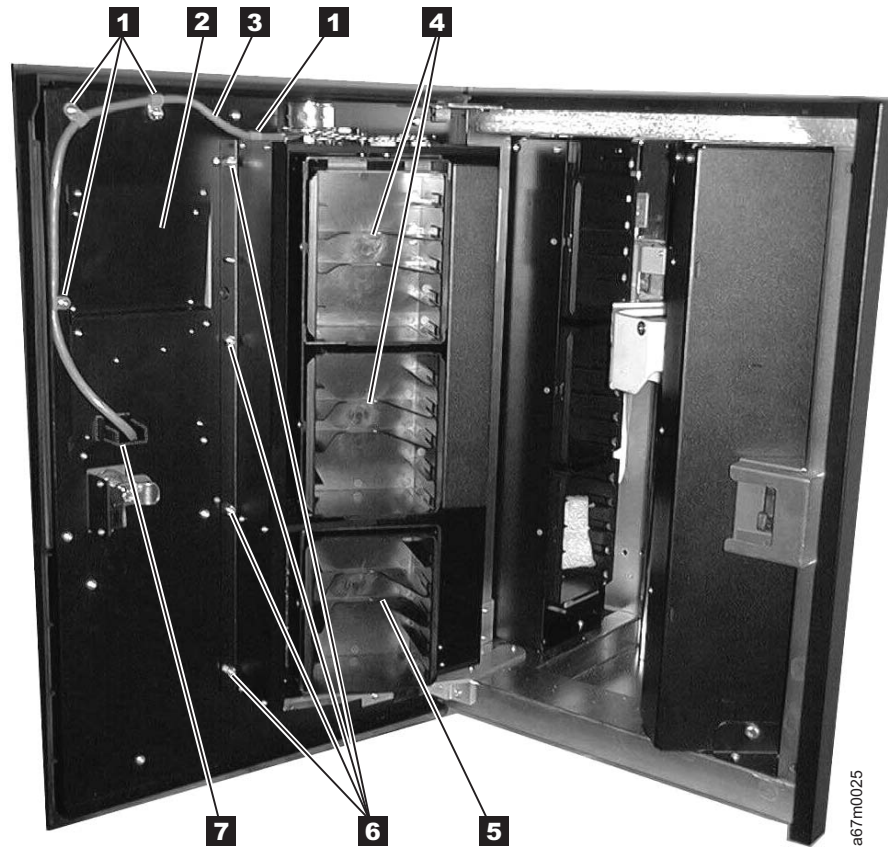
Tools that are required: T20 Torx driver and 11/32 in. nut driver.

Removing the I/O Station

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove all magazines (if present) **4**, **5** and cartridges from the I/O Station.
5. See Figure 8-41 on page 8-51, disconnect the I/O Station cable harness **3** from the Display Assembly **2** by disconnecting cable connector **7**.
6. Remove the four I/O Station cable clamps **1**. Three of the cable clamps are attached to the door using T20 Torx screws and one is attached with a 11/32 in. nut.
7. Remove eight 11/32 in. nuts **6**, four on each side holding the I/O Station assembly **4** to the front door.
8. Remove the I/O Station.

Replacing the I/O Station

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.



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Figure 8-41. I/O Station Removal and Replacement

Single-Slot I/O Station

For I/O station assembly part number, see Table 15-1 on page 15-1.

Tools that are required: T20 Torx driver and 11/32 in. nut driver.

Removing the I/O Station

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. See Figure 8-42, if a cartridge is present at the I/O Station **3**, remove cartridge.
5. See Figure 8-41 on page 8-51, disconnect the I/O Station cable harness **3** from the Display Assembly **2** by disconnecting cable connector **7**.
6. Remove the four I/O Station cable clamps **1**. Three of the cable clamps are attached to the door using T20 Torx screws and one is attached with a 11/32 in. nut.
7. Remove eight 11/32 nuts **6**, four on each side holding the I/O Station assembly **4** to the front door.
8. Remove the I/O Station.

Replacing the I/O Station

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

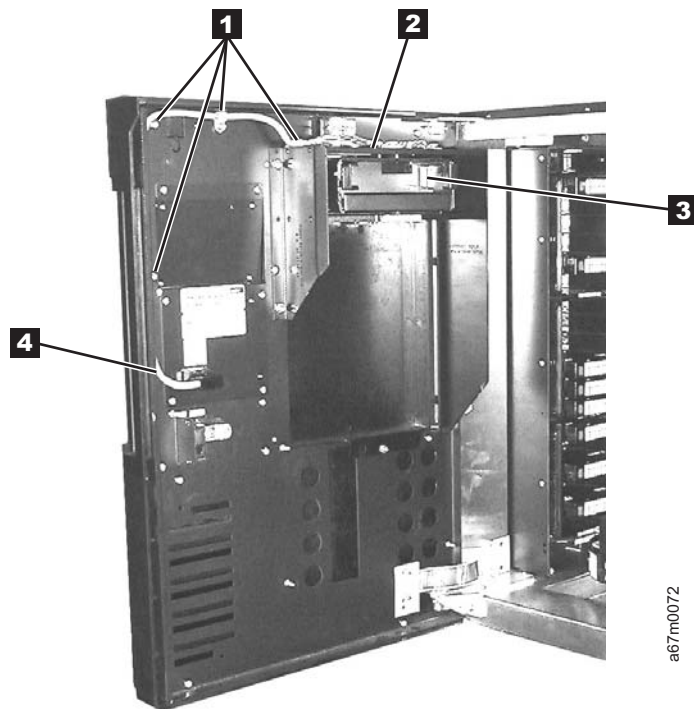


Figure 8-42. I/O Station, Single Slot

Power Supplies Check Procedure

1. Check dc Power Supply by observing light-emitting diode (LED) indicator located on the back of each installed Power Supply, refer to Figure 7-17 on page 7-18. If this LED is RED, replace the Power Supply by using Procedure “dc Power Supply” on page 8-54.
2. Problem which sent you here may be caused by blown fuses (5A) on the ac Input Power Module. Refer to Figure 8-43 for location of fuses. If fuses are blown, replace fuses and power up the Library. If fuses continue to blow, perform Procedure Remove the “ac Input Power Module.”

Power

ac Input Power Module

See Table 15-1 on page 15-1 for ac Power Input Module Part Number.

See Figure 8-43 for locations of components in the following procedure.

Tools that are required: T8 Torx driver.

Removing the ac Input Module

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Disconnect the mainline ac power cable **5** from the ac Input Power Module.
4. Slide the fuse holder **3** out to the stop. Allow fuse holder to tilt down.
5. Check the fuses **3** and replace them if necessary.
6. If you replaced fuses in step 5 and fixed the problem go to “Replacing the ac Input Module.” Otherwise proceed with step 7.
7. Slide fuse holder back into the receptacle. Remove the two Torx screws **4** fastening the ac Power Module to the chassis.
8. Slide the ac Input Module **1** away from the frame and remove the ac Input Module.

Replacing the ac Input Power Module

Perform above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

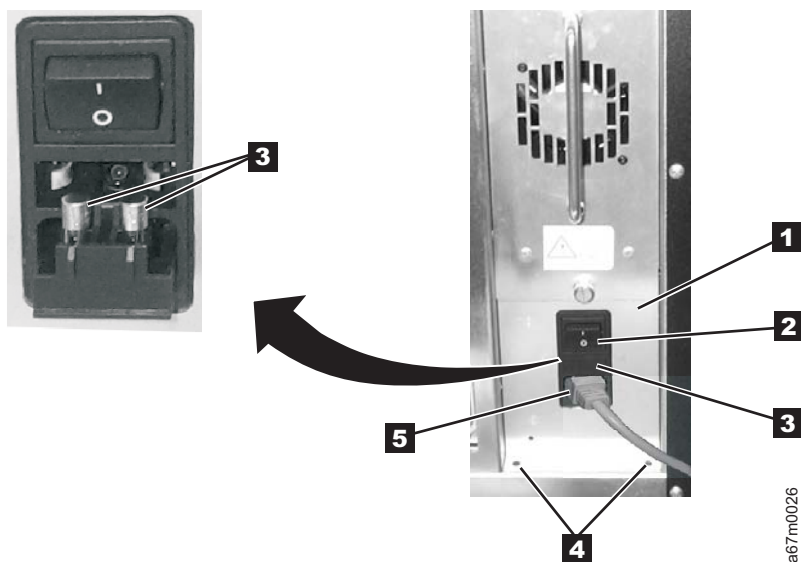


Figure 8-43. ac Input Module Removal and Replacement

dc Power Supply



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

This procedure removes and replaces the dc Power Supply or either supply if redundant supply is present. See Table 15-1 on page 15-1 for dc Power Supply Part Number.

See Figure 8-45 on page 8-56 for locations of components in the following procedure.

Tools that are required: None.

Verifying dc Power Supply Level

Before replacing a dc Power Supply in the Tape Library, verify that you have the correct dc Power Supply.

1. From the rear of the library, locate the one or two dc power supplies that are currently installed in the library (**1** in Figure 8-44).
 - a. If the Type II power architecture (NPA) label **2** is present on the dc Power Supply **1**, then the replacement dc Power Supply also needs to have the NPA label.
 - b. If the NPA label **2** is not present on the dc Power Supply **1**, then the replacement dc Power Supply should not have the NPA label.

Note: The presence of the label indicates that the library contains a Type II power architecture and requires a Type II level of dc Power Supply. The library will not operate properly if the power supplies and power architectures are not at the same level. See “Power Distribution PCBA (Type I)” on page 7-13 and “Power Distribution Board (Type II)” on page 7-14 to verify which power architecture is installed in the library.

2. If the dc Power Supplies do not match, do not continue with this installation. Have the customer contact his or her IBM Business Partner or IBM Sales Representative to order the correct dc Power Supply needed for this procedure. Verify that it is the correct power supply.
3. If the dc Power Supplies match, continue with the installation.

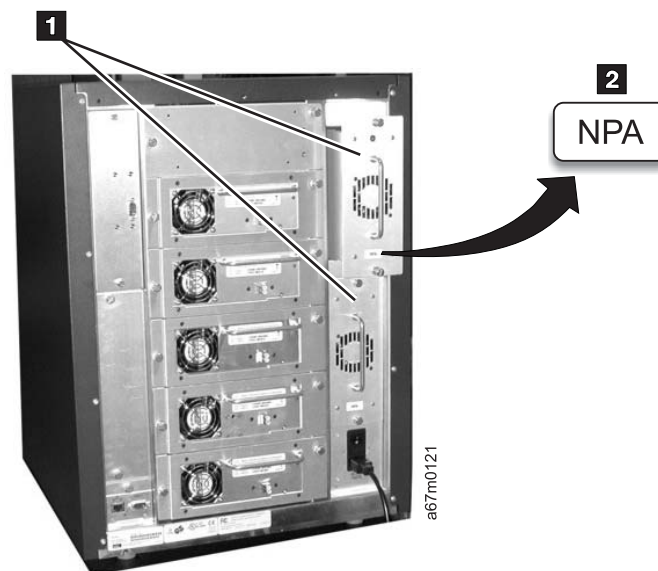


Figure 8-44. Comparing dc Power Supplies

Table 8-1 identifies the effect of mixing dc Power Supplies in libraries that have the Type I power architecture or the Type II power architecture.

Table 8-1. Interchange of Power Supplies with Library Power Architecture

Library Type	Power Supply	Effect
Type I power architecture design	1 Type I	Library operates normally.
	1 Type II	<ul style="list-style-type: none"> Library will not power up (display remains dark). The LED on the back of the Power Supply will remain unlit (neither red or green). There will be a noise (not always clearly audible) coming from one or both stepper motors (grripper and door latch). This is because there is +12 V at the stepper drivers, but no +5 V and they will be in an unknown state. The library should be turned OFF.
	1 Type I / 1 Type II	<ul style="list-style-type: none"> Library will operate. The Type II Power Supply will have the red LED turned on. There will be redundancy for +12 V, but not for +5 V.
Type II power architecture design	1 Type I	<ul style="list-style-type: none"> Library will power up. LED on the back of the original Power Supply will turn red and the display will show SAC D2 00, see Table 6-1 on page 6-4
	1 Type II	Library operates normally.
	1 Type I / 1 Type II	<ul style="list-style-type: none"> Library will operate. LED on the back of the original Power Supply will turn red and the display will show SAC D2 00, see Table 6-1 on page 6-4

Removing the dc Power Supply

1. If you have a redundant dc Power Supply installed in the Library go to step 4. The failing dc Power Supply can be removed with the Library powered On.
2. If you do not have a redundant dc Power Supply: Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
3. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
4. Loosen the two captive thumbscrews **3** located on the back of power supply, see Figure 8-45 on page 8-56 and slide dc Power Supply out of the library.

Replacing the dc Power Supply

Perform the removal steps in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

Before inserting dc Power Supply, be sure to orient Power Supply so LED indicator **1** is as seen in Figure 8-45.

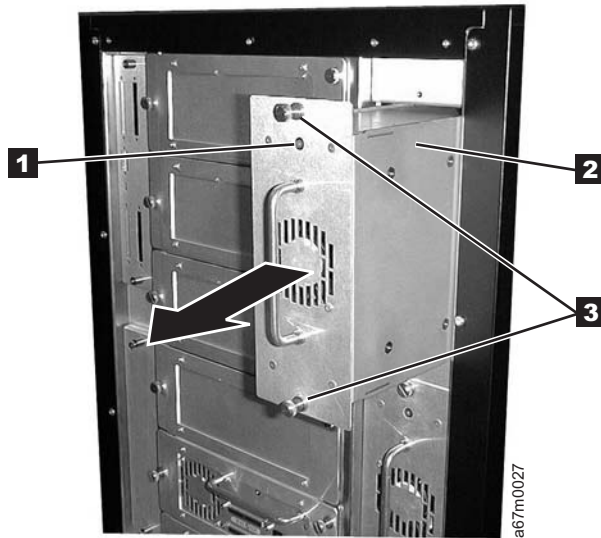


Figure 8-45. DC Power Supply Removal and Replacement. Figure shows a converted library.

Door Lock Assembly

See Table 15-1 on page 15-1 for door lock Part Number.

See Figure 8-46 for location of components in following procedure.

Tools that are Required: *Phillips head screwdriver.*

Removing the Door Lock Assembly

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. See Figure 8-46, note the position of the latch **3**. Latch must be in the same position during replacement as during removal.
5. Remove Phillips head screw **4** from back of door lock assembly. Be careful to retain small spacer **2** which is behind the latch **3**. This spacer must be used when the new mechanism is installed. Pull the tumbler assembly **1** out the front of lock housing.

Replacing the Door Lock Assembly

Do not over tighten the Phillips Head Screw while replacing assembly. Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

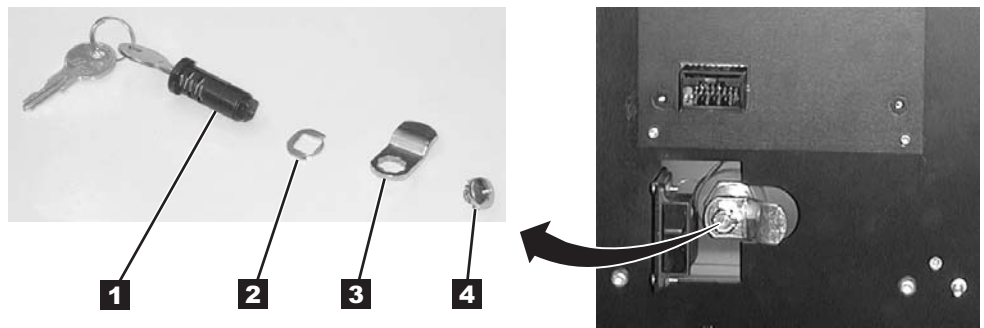


Figure 8-46. Door Lock Assembly, Remove/Replace

Door Interlock Switch and Cable Assembly

See Table 15-1 on page 15-1 for Door Interlock Switch and Cable Assembly Part Number.
See Figure 8-47 for locations of components in the following procedure.

Tools that are required: *T8 Torx driver and small pliers.*

Removing the Door Interlock Switch

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. Remove the two T8 Torx screws **3** and nuts that attach the Door Interlock switch **2** to the door. You will need the pliers to hold the nuts while removing the screws.
5. Remove the six T8 Torx screws **1** that attach the Operator Panel Assembly **4** to the door. See Procedure Remove the "Display Assembly" on page 8-47 for more information.
6. Disconnect the cable between the Door Interlock switch and the Display Control Board.
7. Remove the switch from the bracket.

Replacing the Door Interlock Switch

Do not over tighten the screws and nuts when reinstalling the Door Interlock Switch. Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

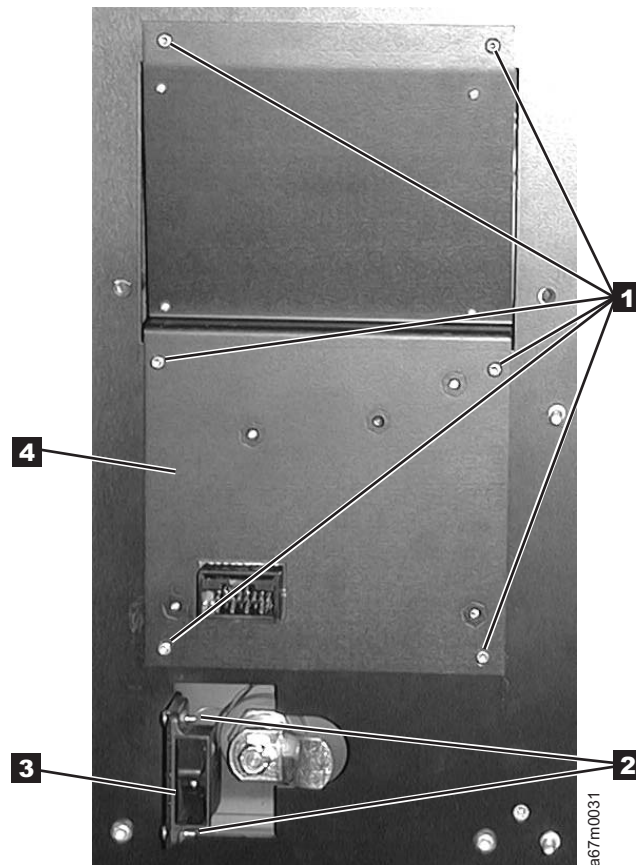


Figure 8-47. Door Interlock Switch Removal and Replacement

Plastic Top Door

See Table 15-1 on page 15-1 for Plastic Top Door Part Number.

See Figure 8-48 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver and T20 Torx driver.*

Removing the Plastic Top Door

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. The Plastic Top Door attaches to the door frame with eight screws **1**. Remove these screws shown in Figure 8-48.
5. Remove the Plastic Top Door from the door frame, you may need to close the door slightly. Guide the lock **2** through the opening in the door frame to remove the door.
6. Remove the rubber Operator Panel Button Assembly from the door (this is to be re-installed in the replacement door).

Replacing the Plastic Top Door

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

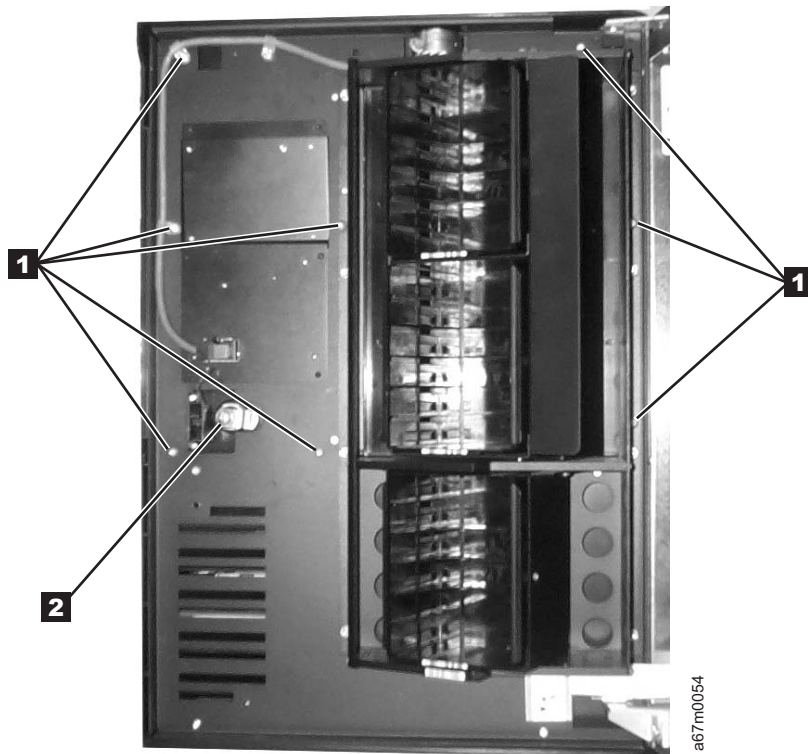


Figure 8-48. Plastic Top Door Removal and Replacement

Plastic Lower Front Door Panel

See Table 15-1 on page 15-1 for plastic lower front door panel part number.
See Figure 8-49 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver and T20 Torx driver.*

Removing the Plastic Lower Front Door Panel

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. The Plastic Lower Front Door Panel is attached to the door frame with four screws **1**. Remove these screws shown in Figure 8-49.
5. Remove the Plastic Lower Front Door Panel **2** from the door frame.

Replacing the Plastic Lower Front Door Panel

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

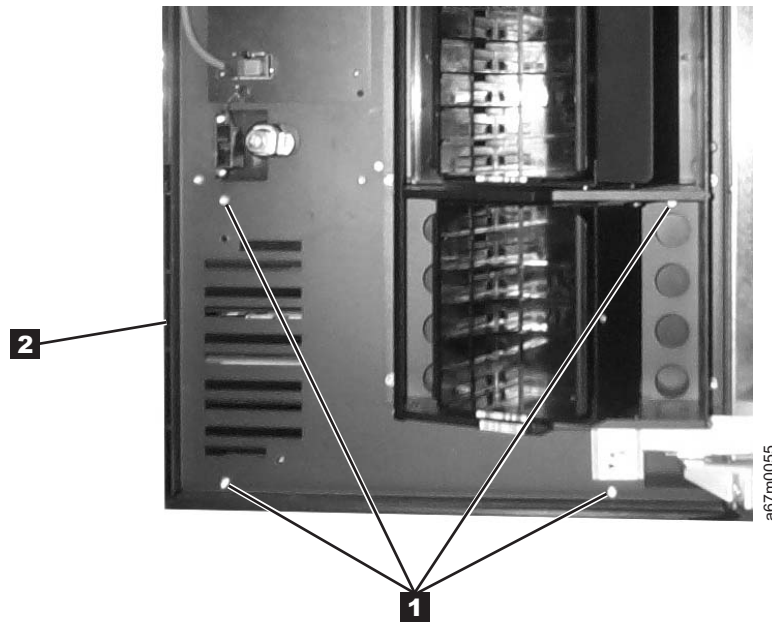


Figure 8-49. Plastic Lower Front Door Panel Removal and Replacement

Side Cover

See Table 15-1 on page 15-1 for Side Cover Part Number.

See Figure 8-50 for locations of components in the following procedure.

Tools that are required: *Phillips screwdriver.*

Removing the Side Cover

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. Remove the four Phillips screws **1** as shown in Figure 8-50. After removing the Phillips screws, the cover **2** can only be removed if you open the front door.

Replacing the Side Cover

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

Note: Replacement cover that is used for either side of the Library.

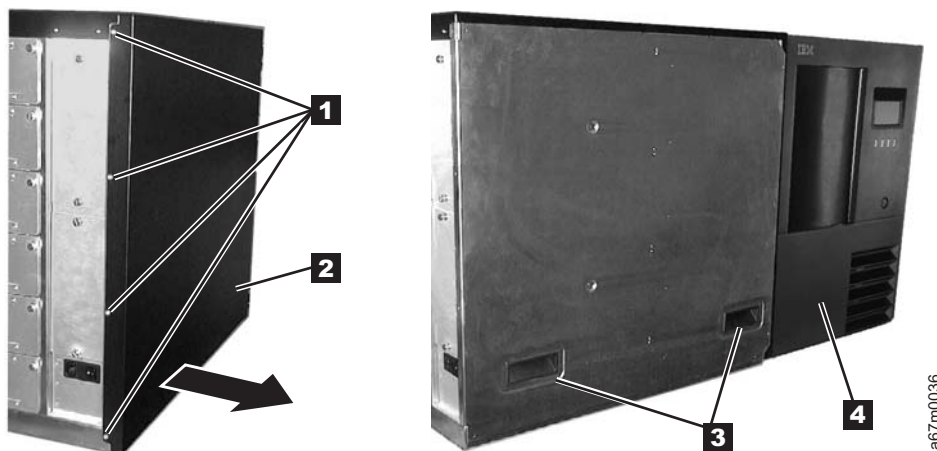


Figure 8-50. Side Cover Removal and Replacement

Top Cover

See Table 15-1 on page 15-1 for Top Cover Part Number.

See Figure 8-50 on page 8-61 for locations of components in the following procedure.

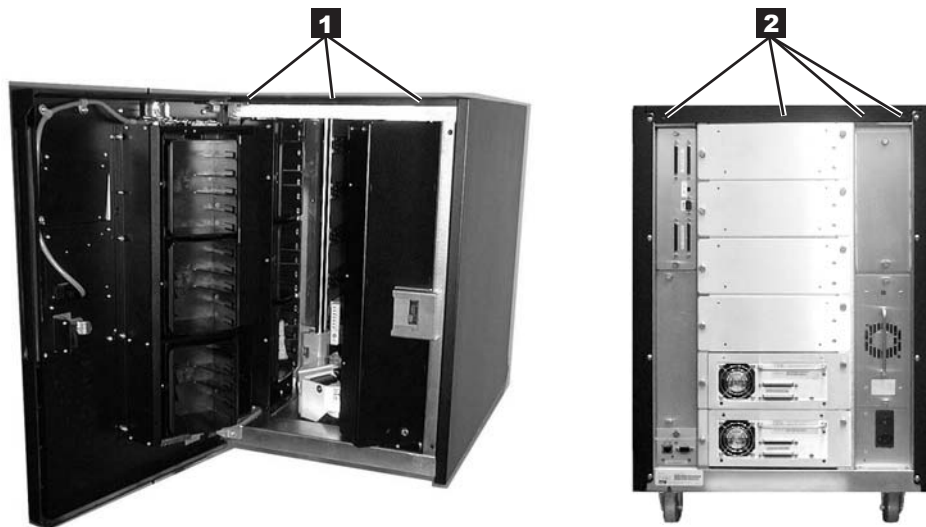
Tools that are required: *Phillips screwdriver, T10 Torx driver.*

Removing the Top Cover

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. See Figure 8-51, remove the three screws **1** in front and four screws **2** in back.
5. Remove top cover.

Replacing the Top Cover

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.



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Figure 8-51. Top Cover Removal and Replacement. Figure shows converted library.

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Overview

This chapter describes common service procedures for the Tape Library.

Methods of Capturing Logs

There are three methods for retrieving logs:

- Look at the logs by using the Operator panel (Main Menu >Status > Logs then select either >Error Log or >Command Log). Collect as many errors and commands as possible.
- Use HyperTerminal on a PC running Windows that is equipped with an RS-232 port and a **straight through** serial cable P/N 19P1945 (a null modem cable will not work) connected to the serial port on the host interface board (serial diagnostic port board).
- Collect the Command and Error Logs by using the Remote Management Unit (RMU). Refer to the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide* for instructions about how to perform this task.

Capturing Logs by Using HyperTerminal

To isolate issues, command logs and error logs may be collected from the Ultrium Scalable Tape Library by using the Microsoft HyperTerminal application. If the issue relates to the boot-up process, the serial log may also need to be collected. Serial log capture is performed by recording the machine's boot-up steps, which are logged into the serial port (as text) as the events occur within the library.

The method of capture logs requires a PC running Windows, and equipped with an RS-232 serial port and a straight-through serial cable (a null-modem cable will not work). Connect the serial cable from the PC COM port (any COM port will work) to the serial port located on the SCSI host interface board (serial diagnostic port board).

After a capture is complete, it may be attached to an e-mail message and forwarded to a support center at their request. When you close the HyperTerminal session, you can save it for future use.

Capturing Command Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** —> **programs** —> **accessories** —> **communications** —> **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583_command_logs.TXT.
9. Select the Start radio button.
10. From Status menu of the 3583 operator panel, select Logs.
11. From the Logs submenu, select Command Log.
12. Press the print button to send the command log to the 3583 serial port and to your PC's HyperTerminal session.
13. Wait for the transfer to complete.
14. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

Capturing Error Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583_error_logs.TXT.
9. Select the Start radio button.
10. From Status menu of the 3583 operator panel, select Logs.
11. From the Logs submenu, select Error Log.
12. Press the print button to send the command log to the 3583 serial port and to your PC's HyperTerminal session.
13. Wait for the transfer to complete.
14. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

Capturing Boot-Up Logs

1. Power-off the library.
2. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
3. Name the new connection (for example, 3583 serial capture).
4. Configure the session for the correct Comm Port in the Connect using field.
5. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
6. From the HyperTerminal transfer pulldown, select Capture Text.
7. Select the directory and set the file name for the output text file. For example, C:\Temp\3583_Boot_up.TXT.
8. Select the Start radio button.

In the step that follows, stop the capture as noted in step 10 when the library indicates ONLINE and information stops scrolling across your HyperTerminal screen.

9. Power-on the library and watch for ONLINE . The following screen displays:

```
# ADIC Scalar 100 Main Boot ROM
# Copyright (C) 1999,2000 by Advanced Digital Information Corporation.
# All Rights Reserved. Non-published.
# Revision: 2.01.0001 10/12/2000
# We are a Production Main board and we are
```

```
ALIVE
```

10. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

Capturing Serial Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583_Serial_log.txt.
9. Select the Start radio button.
10. Power-off the library, wait 10 seconds, then power-on the library. The following screen displays:

```
# ADIC Scalar 100 Main Boot ROM
# Copyright (C) 1999,2000 by Advanced Digital Information Corporation.
# All Rights Reserved. Non-published.
# Revision: 2.01.0001 10/12/2000
# We are a Production Main board and we are

ALIVE
```

11. After the error or capture sequence is shown, issue the PLOG and PERR commands to include command and error log details.
12. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

Copying a Drive Dump to the Server Using the LTO-TDX Tool

The tool, LTO-TDX, is the fastest method (approximately 5 seconds) for uploading LTO drive error dumps (the current dump and a forced dump). In addition, this tool can be used to download LTO drive firmware across the SCSI bus or fibre channel. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO Gen 1 and Gen 2 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. Upload a dump of the drive firmware logs from the drive to a computer system
 - b. Download firmware to the drive (see **"Firmware download function"** on page 9-20)
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 shall 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 to make sure the drive is not in use when firmware is downloaded or a dump is taken. He also must remove any cartridge 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, the tool will inform the user that there are none before closing the tool window.

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 Firmware

These instructions update firmware on one or more of the following IBM 3583 model L18/L36/L72 devices:

- LTO Ultrium 1 and LTO Ultrium 2 Tape Drive
- Multi-Path (firmware above 5.14.0000) and Non-Multi-Path (firmware up to 5.00.00) libraries
- Remote Management Unit (RMU)
- SAN Data Gateway

Attention::

1. To ensure optimum performance from the Ultrium Scalable Tape Library, use the latest level of firmware. It is the customer's responsibility to obtain and install all firmware.
2. Before visiting the web to obtain the latest level of library firmware, you must determine which generation of library firmware that you have. Library firmware for a library without the Multi-Path feature starts with 3.xx.xxxx; library firmware for a library with the Multi-Path feature starts with 5.xx.xxxx. A library without the Multi-Path feature cannot be loaded on a library that is already enabled with the Multi-Path feature.

You can update firmware for the drives, the library, or the RMU by using the following methods:

- RMU
- SCSI bus
- FMR tape (drive firmware only)
- Library serial port (library firmware only)
- San Data Gateway Module (optional, if the library has an optional San Data Gateway Module installed)

Tools and Methods Available for Tape Drive and Library Firmware Updates

Instructions for using the following tools and methods for updating firmware are included this document.

- "CE Direct Connect Method for Downloading Firmware"
- ITDT

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 web site (<http://www.ibm.com/storage/ito>) .

- "LTO-TDX SCSI Tape Drive Firmware Update and Drive Dump Retrieval Tool" on page 9-8
- "SCSI NTUTIL (Windows) and TAPEUTIL (AIX) Drive and Library Firmware Update Tools" on page 4-115
- "RMU Method" on page 9-8
- "FMR Cartridge (Drive Only)" on page 9-8
- "SAN Data Gateway Firmware Update" on page 9-8

CE Direct Connect Method for Downloading Firmware

Since the RMU is the most efficient method for downloading library and RMU firmware, the following procedure is listed to provide the CE with instructions to enable a direct ethernet connection to the library RMU using the CE laptop.

1. Prior to attaching the PC to the RMU, ensure that the firmware file (or files) to be downloaded (library, RMU or drive) is present in a directory on the PC.
2. Disconnect the customer's ethernet cable on the RMU and use an ethernet crossover cable (P/N 09L0294) to directly attach your PC to the RMU.

3. On the PC, right Click on "Network Places" and pick Properties.
4. Right Click on the LAN Connection for the Ethernet and pick Properties.
5. Pick "Internet Protocol (TCP/IP)" and then Properties.
6. Turn ON the "Use the following IP address" : Hard code the IP address to be 1 digit off in the last field of the RMU IP address from the front panel.

Note: To see the RMU Network parameters: **More->Setup->Library->RMU**

7. Set the PC Gateway and Mask the same as the RMU front panel config data.

Note: If the customer is not using the RMU, create an RMU IP, Gateway and Mask....for example:

IP : 192.001.001.101

Gateway : 192.001.001.000

Mask : 255.255.255.000

For this example, the PC's IP address could be 192.001.001.100

8. Reboot the laptop.
9. Bring up the WEB page by typing in the URL on the browser (Internet Explorer or Netscape) as "http://xxx.xxx.xxx.xxx" where "xxx.xxx.xxx.xxx" is the IP address of the RMU.
10. Login to the RMU firmware page using the name "admin" and the password "secure". If the customer has changed the password, then the current password must be used.
11. When complete, be sure to reattach the customer's ethernet cable to the RMU.

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 web site (<http://www.ibm.com/storage/lto/>) .

A newly designed tool, ITDT, (available on the IBM website during the third quarter of 2004) is a tool with multiple functional capability and is a very quick, convenient and efficient method for both drive and library firmware updates. As a note, both drive and library dump retrievals can be performed by the tool as well. Currently, the tool is very similar to the LTO-TDX drive only firmware update and drive dump retrieval tool (explained in detail later on in the Tape Drive Update firmware paragraph in this section). ITDT is located on the IBM website in the same area as the LTO-TDX tool. Download the tool by visiting <http://www.ibm.com/storage/lto/>. Below are listed some of the capabilities of this tool:

1. Firmware update capability via SCSI to all IBM LTO Tape Drive and Tape Library products.
2. The tool does not require any special device drivers.
3. The tool is available for most major platforms (Windows, AIX, SUN, Linux, NetWare).
4. The tool is capable of uploading drive and library dump files.
5. The tool capable of exercising drive and library diagnostics including drive read/write diagnostics.
6. The tool scans the SCSI bus and will find and display for selection all IBM LTO devices. The tool will not display and allow for selection any non-IBM device.
7. Each function has "Help" selection which explains the required syntax as well as a brief explanation of the particular function.
8. A Readme text file will be posted with the .exe for a thorough explanation of initial tool download information from the web as well as explanation of tool capabilities.
9. The tool is currently a "command line" tool with a simple entry by keying in the executable name, itdt, from the directory where the tool is located.

- | In the following firmware update sections which explain each method in detail, only a brief mention of ITDT
- | will be made since the Readme text file will more fully explain tool usage.

LTO-TDX SCSI Tape Drive Firmware Update and Drive Dump Retrieval Tool

This is a command line tool available on the IBM web site and explained fully in the Tape Drive Firmware Update section. This tool is also device driver independent.

SCSI NTUTIL (Windows) and TAPEUTIL (AIX) Drive and Library Firmware Update Tools

Both of these tools require the IBM device drivers to be installed. If the application does not use the IBM device drivers, the application drivers must first be stopped. A full explanation of these tools are located in both the library and drive firmware update sections.

RMU Method

The RMU is a library component method which can be used to update firmware in all library components (library, drive and RMU). The RMU method is a convenient method, however, drive updates will take about 1 hour. The RMU method is the only method listed to update the RMU itself. The RMU method is explained in all firmware update sections.

Library Serial Port Method

The library serial port can be used to update firmware in the library only. A special firmware update executable (3583DLMP.exe) is required and is located on the IBM web site.

FMR Cartridge (Drive Only)

Under certain circumstances where none of the above tools or methods can be used, tape drive FMR cartridges are available to update the tape drive firmware.

SAN Data Gateway Firmware Update

The SAN Data Gateway Module firmware can be updated using one of the following two methods (both methods are explained in the SAN Data Gateway Setup, Operator, and Service Guide):

1. The Controls pull down menu on the client/server software (ethernet). This is the most convenient method and recommended method.
- | 2. The SAN Data Gateway Module serial port (not recommended as this method is very slow).

Installation Overview

Complete the following steps to update library, drive, RMU, and SAN Data Gateway firmware:

- “Step 1. Register for My Support”
- “Step 2. Determine current firmware levels installed on your library” on page 9-10
- “Step 3. Download latest firmware from the web” on page 9-11
- “Step 4. Update RMU firmware” on page 9-12
- “Library Firmware” on page 14-59
- “Drive Firmware” on page 14-60
- “Step 7. Update SAN Data Gateway firmware” on page 9-24

For instructions on completing each step, refer to the sections that follow.

Step 1. Register 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:

1. Visit the web at <http://www.ibm.com/support/mySupport>.
2. Under **We use IBM Registration**, click on **Register**.
3. Fill in the information required for registration. Items with an asterisk (*) are required fields.
4. Login. Enter your **User ID** and **Password** and click **Go** to access My Support.
5. Enter the information required for your **My support profile**.
 - a. Under **Select a product family:**, select **Computer Storage** and click on **Go**.
 - b. Under **Computer Tape Storage**, select **Computer Tape Libraries**.
 - c. Click **Save & return** at the bottom of the page.
 - d. Review your profile for correctness.
 - e. Under **Select mail preferences**, check the boxes labeled **Flashes** and **Downloadable files**, and click **Submit**.
 - f. Under **Welcome, (your name)**, click on **Sign out** to end your session.

Step 2. Determine current firmware levels installed on your library

While determining levels of firmware currently installed on your library, record these firmware levels in Table 4-1 on page 4-117.

After determining the current levels of firmware installed on your library, determine the latest levels of firmware that are available for the library, drives, RMU, and SAN Data Gateway. For information on determining the latest levels of firmware available and downloading the firmware, see “Step 3. Download latest firmware from the web” on page 9-11.

Table 9-1. Firmware levels

Device	Currently Installed Firmware Levels	Latest Firmware Level on Web
LTO Ultrium 1 Tape Drive SCSI		
LTO Ultrium 2 Tape Drive SCSI		
LTO Ultrium 2 Tape Drive Fibre		
LTO Ultrium 3 Tape Drive SCSI		
LTO Ultrium 3 Tape Drive Fibre		
Non-Multi-Path Library (firmware below 4.99.002)		
Non-Multi-Path RMU		
Multi-Path Library (firmware above 5.14.0001)		
Multi-Path RMU		
SAN Data Gateway Firmware		

Determining current level of library firmware

To determine the version of library firmware using the 3583 display:

1. Select **More**.
2. Select **About**.
3. Record the current firmware version of the library in Table 9-1 for use later in this procedure.

Determining current level of RMU firmware

To determine the version of RMU firmware using the 3583 display:

1. Select **Details** in the **About Menu** screen.
2. Scroll down until *RMU* displays.
3. Record the current firmware version of the RMU in Table 9-1 for use later in this procedure.
4. Press **OK** then **Back** to return to the **Main Menu** initial screen.

Determining current level of drive firmware

To determine the version of drive firmware using the 3583 display:

1. Select **Status**.
2. Select **Drives**.
3. Record the current firmware version of each drive in Table 9-1 for use later in this procedure.
4. Select **OK** then **Back** to return to the **Main Menu**.

Determining current level of SAN Data Gateway firmware

To determine the SAN Data Gateway firmware level, refer to “Determining the level of firmware on the SAN Data Gateway Module” on page 9-24. Record the current firmware level of the SAN Data Gateway in Table 9-1.

Step 3. Download latest firmware from the web

Note: Before updating firmware on the drives, the library, or the RMU, use your server to set the library and drives OFFLINE for all attached servers.

To find out whether the drives, the library, the RMU, or the SAN Data Gateway are loaded with the most current firmware:

1. Visit the web at <http://www.ibm.com/storage/1to> .
2. Compare the latest level of firmware against the firmware currently on your device (library, drive, or RMU).
3. If the latest level available is at a higher number than the firmware currently on your device:
 - a. Record the latest level firmware number in Table 9-1 on page 9-10.
 - b. Download the firmware onto your server.

For the SAN Data Gateway Client/Server Software, the ITDT Library and Drive Firmware Download Tool, and the LTO-TDX Drive Firmware Download 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 web site (<http://www.ibm.com/storage/1to>) .

- Visit the web at <http://www.ibm.com/storage/1to> .

Note: Update your Library Configuration Form with the latest firmware level information.

Step 4. Update RMU firmware

If you have not already done so, determine the current version of RMU firmware installed on your library. For instructions, see “Determining current level of RMU firmware” on page 9-10.

Note: If the RMU firmware is down-level use the RMU to update the RMU firmware.

- If the RMU has a firmware version lower than the level recorded in Table 9-1 on page 9-10 then you should install the new RMU firmware. See “Step 3. Download latest firmware from the web” on page 9-11, then go to “Updating RMU firmware.”
- If the RMU firmware is already at the latest level, proceed to “Library Firmware” on page 14-59.

Updating RMU firmware

Note: Ensure that you have downloaded the latest firmware from <http://www.ibm.com/storage/1to>

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the xxxx.lif file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist using the RMU IP address.
- ___ 5. Select the Firmware tab (login, if necessary). The firmware page displays.
- ___ 6. Select **RMU**.
- ___ 7. Enter the path and filename of the library firmware file, or browse for the file.
- ___ 8. Select **Update Firmware**.
- ___ 9. Wait for the firmware update to complete.
- ___ 10. Verify that the firmware update completed successfully by checking the RMU firmware version as described in “Determining current level of RMU firmware” on page 9-10.
 - If the RMU firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully. Proceed to “Step 5. Update library firmware” on page 9-13.
 - If the RMU firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 5. Update library firmware

If you have not already done so, determine the current version of library code installed on your library. For instructions, see “Determining current level of library firmware” on page 9-10.

- If the library has a firmware version lower than the level recorded in Table 9-1 on page 9-10 then you should install the new library firmware. See “Step 3. Download latest firmware from the web” on page 9-11, then go to “Updating library firmware.”
- If the library firmware is at the latest level, proceed to “Step 6. Update drive firmware” on page 9-18.

Note: In most cases the host server provides alternate methods of determining the Inquiry information - including the firmware version - of attached SCSI devices. These methods (such as TapeUtil or NTUtil) may be used if you are familiar with them, but they are not covered in these instructions.

Updating library firmware

Important: If the library firmware is currently at version 2.6x.xxxx, do NOT use the SCSI method to update the library firmware. Instead, use the RMU or serial port methods.

Attention: When updating library firmware, do not power-off the 3583 Library for at least 5 minutes after the update is complete or the library may become unusable.

Review the following methods of updating library firmware to determine which method you should use:

- **Using the RMU:** To update library firmware using the Remote Management Unit (RMU), go to “Updating library firmware using the RMU.”

Note: If your library has an RMU and you are familiar with using a web browser to work with the library then the RMU method is recommended. If your library does not have an RMU the serial port method is recommended.

- **Using the library serial port:** To update library firmware using the library serial port and the download program, go to “Updating library firmware using the library serial port” on page 9-14.
- **Using SCSI:** To update library firmware using SCSI, go to “Updating library firmware using SCSI” on page 9-14.

Updating library firmware using the RMU:

Note: Ensure that you have downloaded the latest firmware from <http://www.ibm.com/storage/lto>

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Vx_xx_xx.lif file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist using the RMU IP address.
- ___ 5. Select the Firmware tab (login, if necessary). The firmware page displays.
- ___ 6. Select **Update Library Firmware**.
- ___ 7. Enter the path and filename of the library firmware file, or browse for the file.
- ___ 8. Select **Update Firmware**.
- ___ 9. Wait for the firmware update to complete. The library will reboot and run its Power On Self Test (POST).
- ___ 10. Verify that the firmware update completed successfully by checking the library firmware version as described in “Determining current level of library firmware” on page 9-10.
 - If the library firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully. Go to “Step 6. Update drive firmware” on page 9-18.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware using the library serial port:

Note: Ensure that you have downloaded the latest firmware and executables from <http://www.ibm.com/storage/1to>. For Non-Multi Path use download.exe and for Multi Path use 3583DLMP.exe. You will need the firmware and the executable in the same directory.

To use this procedure you must have a pass-through serial cable (provided with the library) connected between the library serial port and the serial (COM) port on a PC running DOS or Windows95/98/NT/2000.

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Vx_xx_xx.lif file from the temporary directory on the server.
- ___ 4. Locate the download.exe (for non-multi-path libraries) or 3583DLMP.exe (for multi-path libraries) file from the temporary directory on the server.
- ___ 5. On the PC, go to a command prompt and change directory (CD) to the temporary directory where the library firmware and download.exe or 3583DLMP.exe files are located. As an example, if the files are located in C:\TEMP, type CD \TEMP and press Enter.
- ___ 6. Type **DOWNLOAD -C1 -F<filename>.lif** (for non-Multi-Path) or **3583DLMP -C1 -F<filename>.lif** (for Multi-Path). Then press Enter.

Note: Characters C and F are case sensitive - they must be capitalized.

Note: -C specifies the PC serial port number. -C1 is COM1. If you are using COM2 change the -C1 to -C2 etc.

Note: -F<filename> specifies the file name of the library firmware to be downloaded.

- ___ 7. Wait for the firmware update process to complete. The library will reboot and run its POST.
- ___ 8. Verify that the firmware update completed successfully by checking the library firmware version as described in "Determining current level of library firmware" on page 9-10.
 - If the library firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully. Go to "Step 6. Update drive firmware" on page 9-18.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware using SCSI: Use the following information to assist you in downloading library firmware from your server (host system) over the SCSI bus using the device drivers and utilities supplied by IBM.

For more detailed information about using the IBM device drivers and utilities (NTUTIL or TAPEUTIL), refer to the *IBM Ultrium Device Drivers Installation and User's Guide* that was shipped with the library. For the latest version of the User's Guide, visit the web at <http://www.ibm.com/storage/1to>.

- For information on the most efficient method of updating library firmware, go to "**Updating Library Firmware over the SCSI bus using the ITDT Tool**" on page 9-15.

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 web site (<http://www.ibm.com/storage/ito>) .

- If the library is connected to a Windows server, go to “**Updating library firmware over the SCSI bus using NTUTIL (Windows).**”
- If the library is connected to a Unix server, go to “**Updating library firmware over the SCSI bus using TAPEUTIL (Unix)**” on page 9-16.

Note: Unix includes AIX, Sun Solaris, HP-UX, Linux, etc.

Updating Library Firmware over the SCSI bus using the ITDT Tool:

For information on the ITDT Tool, see “ITDT SCSI Firmware Update, Dump Retrieval and Library/Drive Test Tool” on page 9-7.

Updating library firmware over the SCSI bus using NTUTIL (Windows):

The following procedure describes how to update the library firmware using NTUTIL.

- ___ 1. If you have not already done so, install the IBM Ultrium Device Driver.
- ___ 2. If you are using a software application that utilizes a different device driver, you will need to stop that device driver and then start the IBM Ultrium Device Driver. To start or stop a device driver perform the following steps:

- Windows NT:

- ___ a. Click on the Windows START button.
- ___ b. Select Settings, then click on Control Panel.
- ___ c. Double-click on Devices.
- ___ d. Scroll down to the device driver you want to start/stop.
- ___ e. Click on the device driver to highlight it.
- ___ f. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- Windows 2000:

- ___ a. Click on the Windows START button.
- ___ b. Select Settings, then click on Control Panel.
- ___ c. Double-click on Administrative Tools.
- ___ d. Double-click on Computer Management.
- ___ e. Click on Device Manager.
- ___ f. Scroll down to the device driver you want to start/stop.
- ___ g. Click on the device driver to highlight it.
- ___ h. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- ___ 3. Open a Command Prompt and change the prompt to the temporary directory where you downloaded and extracted the firmware file. As an example, if the firmware file is in C:\TEMP then type **CD \TEMP** and press Enter.
- ___ 4. Type **NTUTIL** and press Enter.
- ___ 5. Type **1** and press Enter to select Manual Test.
- ___ 6. Type **8** and press Enter to select Library Mode.
- ___ 7. Type **88** and press Enter to select List registered devices.
- ___ 8. Write down the tape and library paths for use later in this procedure.
- ___ 9. Type **1** and press Enter to set device special file.
- ___ 10. Type the name of a tape path displayed in the previous step and press Enter. Then type the name of the library path displayed in the previous step and press Enter.
- ___ 11. Type **20** and press Enter to open both the drive and media changer. When prompted to select a Mode, type **1** and press Enter to select Read/Write mode.
- ___ 12. Type **49**, press Enter, then choose "library" or "drive".
- ___ 13. At the NTUtil Command Prompt, type **82** to update microcode.
- ___ 14. Follow the instructions to select the device you want to update.
- ___ 15. When prompted to enter the FMR name, type the file name of the library firmware file **without the .lif extension** and press Enter.

Note: Updating the library firmware using NTUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 16. Close the NTUTIL session.
- ___ 17. Verify that the firmware update completed successfully by checking the library firmware version as described in "Determining current level of library firmware" on page 9-10.
 - If the library firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully. Go to "Step 6. Update drive firmware" on page 9-18.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating library firmware over the SCSI bus using TAPEUTIL (Unix):

The following procedure describes how to update the library firmware in the 3583 Tape Library over the SCSI bus using TAPEUTIL.

Note: Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* for instructions on usage of the TAPEUTIL utility for the particular Operating System that the device is attached to. This document is also available on the IBM website, <http://www.ibm.com/storage/1to>. The instructions below are given as an example and refer to the AIX Operating System.

- ___ 1. Change the current directory to the temporary directory where the library firmware file is located.

Note: Make note of the exact filename of the firmware that is to be used (case sensitive).
- ___ 2. Ensure that the library is **Available** (not just defined) to the Atape device driver by listing the devices. Use the command **lsdev -Cc tape**.
- ___ 3. Open a TAPEUTIL session.
- ___ 4. Select option 4 - tape drive service aids.
- ___ 5. Select Microcode load.
- ___ 6. Select the library device you want to upgrade.

- ___ 7. Enter the exact filename you noted in step 1 on page 9-16.
- ___ 8. Press F7 Commit.

Note: Updating the library firmware using TapeUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 9. Close the TAPEUTIL session.
- ___ 10. Verify that the firmware update completed successfully by checking the library firmware version as described in “Determining current level of library firmware” on page 9-10.
 - If the library firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully. Go to “Step 6. Update drive firmware” on page 9-18.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the library firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 6. Update drive firmware

If you have not already done so, determine the current level of drive firmware. For instructions, see “Determining current level of drive firmware” on page 9-10.

- If any drive has a firmware version lower than the level recorded in Table 9-1 on page 9-10, then you should install the new drive firmware. See “Step 3. Download latest firmware from the web” on page 9-11, then go to “Updating drive firmware.”
- If the drive firmware in all drives is already at the latest level, proceed to “Step 7. Update SAN Data Gateway firmware” on page 9-24.

Note: In most cases the host server provides alternate methods of determining the Inquiry information - including the code version - of attached SCSI devices. These methods (such as TapeUtil or NTUtil) may be used if you are familiar with them, but they are not covered in these instructions.

Updating drive firmware

Attention: When updating drive firmware, do not power-off the 3583 Library for at least 5 minutes after the update is complete or the drives may become unusable.

Review the following methods of updating drive firmware to determine which method you should use:

- **Over the SCSI bus using the ITDT Tool:** To update drive firmware using the new SCSI ITDT tool, go to “Updating drive firmware over the SCSI bus using the ITDT Tool” on page 9-19.

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 web site (<http://www.ibm.com/storage/ito>) .

- **Over the SCSI bus using the LTO-TDX Tool:** To update drive firmware using the SCSI LTO-TDX tool (for Windows, Linux, and Netware), go to “Updating drive firmware over the SCSI bus using the LTO-TDX Tool” on page 9-19.

Note: The LTO-TDX tool is the most efficient method for downloading LTO drive firmware across the SCSI bus or fibre channel. This is the recommended method for updating drive firmware. The LTO-TDX tool is not device driver dependent.

- **Using the RMU:** To update drive firmware using the Remote Management Unit (RMU), go to “Updating drive firmware using the RMU” on page 9-22.

Note: If your library has an RMU and you are familiar with using a web browser to work with the library then the RMU method is recommended because it is easy. However it takes approximately 60 minutes to update the first drive and 15 minutes for each additional drive.

- **Over the SCS bus using NTUTIL or TAPEUTIL:** To update drive firmware using the SCSI NTUTIL (Windows) or TAPEUTIL (Unix) tools, go to “Updating drive firmware using SCSI.”
- **Using an FMR Tape:** To update drive firmware using an FMR tape, go to “Updating drive firmware using an FMR tape” on page 9-23.

Note: The FMR tape method is only used when the library is attached to an iSeries (AS/400) host server.

Updating drive firmware using SCSI: There are two methods for updating drive firmware using the SCSI bus. ITDT or LTO-TDX is the preferred method for updating drive firmware using the SCSI bus.. NTUTIL and TAPEUTIL are alternate methods and are described in following sections.

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 web site (<http://www.ibm.com/storage/lto>) .

Note: LTO-TDX also has drive dump capture capabilities

Updating drive firmware over the SCSI bus using the ITDT Tool:

To update drive firmware using the new ITDT tool, go to “ITDT SCSI Firmware Update, Dump Retrieval and Library/Drive Test Tool” on page 9-7.

Updating drive firmware over the SCSI bus using the LTO-TDX Tool:

The tool, LTO-TDX, is the most efficient method for downloading LTO drive firmware across the SCSI bus or fibre channel. In addition, this tool can be used to upload LTO drive dumps. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO Gen 1 and Gen 2 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 to a host system (see “Copying a Drive Dump to the Server Using the LTO-TDX Tool” on page 9-4)
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 shall 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 to make sure the drive is not in use when firmware is downloaded or a dump is taken. He also must remove any cartridge 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, the tool will inform the user that there are none 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 does a check 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 shall be asked to remove the cartridge.
3. The tool downloads code to IBM LTO drives ONLY. The tool shall recognize ULT3580-TDX inquiry string devices as well as ULTRIUM-TDX devices. The letter "X" could be 1, 2, 3, or 4.
4. The tool is capable of loading back 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. A message is displayed saying "Updating.....Please Wait" until the reboot is complete. A progress gauge is displayed letting the user know something is still happening.
7. A "Wait" message is displayed on the user screen during firmware load.
8. If the program tries to load code and it 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 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 month, day, hour, minutes, 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 drive firmware over the SCSI bus using NTUTIL (Windows):

The following procedure describes how to update the drive firmware using NTUTIL.

- ___ 1. If you have not already done so, install the IBM Ultrium Device Driver.
- ___ 2. If you are using a software application that utilizes a different device driver, you will need to stop that device driver and then start the IBM Ultrium Device Driver. To start or stop a device driver perform the following steps:
 - Windows NT:
 - ___ a. Click on the Windows START button.
 - ___ b. Select Settings, then click on Control Panel.
 - ___ c. Double-click on Devices.
 - ___ d. Scroll down to the device driver you want to start/stop.
 - ___ e. Click on the device driver to highlight it.
 - ___ f. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- Windows 2000:
 - ___ a. Click on the Windows START button.
 - ___ b. Select Settings, then click on Control Panel.
 - ___ c. Double-click on Administrative Tools.
 - ___ d. Double-click on Computer Management.
 - ___ e. Click on Device Manager.
 - ___ f. Scroll down to the device driver you want to start/stop.
 - ___ g. Click on the device driver to highlight it.
 - ___ h. Click on the Stop or Start button.

Note: If you are using a software application that utilizes a different device driver, you should set the IBM Ultrium Device Driver to Manual mode. To do this click on the device driver to highlight it, then click on the Startup button, select Manual, and click on OK.

- ___ 3. Open a Command Prompt and change the prompt to the temporary directory where you downloaded the firmware file. As an example, if the firmware file is in C:\TEMP then type **CD \TEMP** and press Enter.
- ___ 4. Type **NTUTIL** and press Enter.
- ___ 5. Type **1** and press Enter to select Manual Test.
- ___ 6. Type **88** and press Enter to select List registered devices.
- ___ 7. Write down the tape and library paths for use later in this procedure.
- ___ 8. Type **1** and press Enter to set device special file.
- ___ 9. Type the name of a tape path displayed in the previous step and press Enter. Then type the name of the library path displayed in the previous step and press Enter.
- ___ 10. Type **20** and press Enter to open both the drive and media changer. When prompted to select a Mode, type **1** and press Enter to select Read/Write mode.
- ___ 11. Type **49** and press Enter to issue an Inquiry to verify that you have established a connection to the library.
- ___ 12. At the NTUtil Command Prompt, type **82** to update microcode.
- ___ 13. Follow the instructions to select the device you want to update.
- ___ 14. When prompted to enter the FMR name, type the file name of the drive firmware file **without the .ro extension** and press Enter.

Note: Updating the drive firmware using NTUtil takes about 10 minutes. When the firmware update process has been completed the library will reset itself and go through a normal power on process.

- ___ 15. Repeat this procedure starting from step 8 for each drive.
- ___ 16. Close the NTUTIL session.
- ___ 17. Verify that the firmware update completed successfully by checking the drive firmware version as described in "Determining current level of drive firmware" on page 9-10.
 - If the drive firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the drive firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating drive firmware over the SCSI bus using TAPEUTIL (Unix):

Note: Unix includes AIX, Sun Solaris, HP-UX, Linux, etc.

The following procedure describes how to update the tape drive firmware in the 3583 Tape Library over the SCSI bus using TAPEUTIL.

Note: Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* for instructions on usage of the TAPEUTIL utility for the particular Operating System that the device is attached to. This document is also available on the IBM website, <http://www.ibm.com/storage/1to>. The instructions below are given as an example and refer to the AIX Operating System.

- ___ 1. Change the current directory to the temporary directory where the drive firmware file is located.

Note: Make note of the exact filename of the firmware that is to be used (case sensitive).

- ___ 2. Ensure that the drive is **Available** (not just defined) to the Atape device driver by listing the devices. Use the command **lsdev -Cc tape**.
- ___ 3. Open a TAPEUTIL session.
- ___ 4. Select option 4 - tape drive service aids.
- ___ 5. Select microcode load.
- ___ 6. Enter the exact filename you noted in step 1.
- ___ 7. Press F7 Commit.

Note: Updating the tape drive firmware using TapeUtil takes about 5 minutes. When the firmware update process has been completed the tape drive will reset itself and go through a normal power on process.

- ___ 8. For additional drives, repeat this procedure starting at step 4.
- ___ 9. Close the TAPEUTIL session.
- ___ 10. Verify that the firmware update completed successfully by checking the drive firmware version as described in "Determining current level of drive firmware" on page 4-117.
 - If the tape drive firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

- If the drive firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Updating drive firmware using the RMU:

- ___ 1. Make sure that the host application is not using the library.
- ___ 2. Make sure that no tape cartridges are in the drives.
- ___ 3. Locate the Ultrium1 code xxxxL1S.ro file or Ultrium 2 code xxxxL2S.ro (for SCSI) or xxxxL2F.ro (for Fibre) file from the temporary directory on the server.
- ___ 4. Use your web browser to access the TotalStorage Specialist.
- ___ 5. Select the Firmware tab (login, if necessary). The RMU firmware page displays.
- ___ 6. Select a drive(s) to update.
- ___ 7. Press and hold the **Ctrl** key and left click on each drive you want to update.

Note: If your library has multiple drive types, only select one drive type to update.

- ___ 8. Enter the path and filename of the drive firmware file, or browse for the file.
- ___ 9. Select **Update Firmware**.
- ___ 10. Wait for the firmware update to complete.

- ___ 11. Verify that the firmware update completed successfully by checking the drive firmware version as described in “Determining current level of drive firmware” on page 9-10.
 - If the drive firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

 - If the drive firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.
- ___ 12. If you have more drive types to update, go back to step 5 on page 9-22 and update the next drive.

Updating drive firmware using an FMR tape:

Note: If using the FMR process order the FMR tape separately.

- ___ 1. Do not load it into the tape drive at this time, but have it ready to load later in this procedure.
- ___ 2. Make sure that the host application is not using the library or tape drive.
- ___ 3. Make sure that no tape cartridges are in the drives and that the top slot of the I/O Station is empty.
- ___ 4. To install the new firmware image using the FMR tape, select **Command → Drives → Firmware Update**.
- ___ 5. Open the I/O station.
- ___ 6. Place the FMR tape into the top slot of the I/O station.
- ___ 7. Close the I/O station. The library executes the TEACH and INVENTORY procedures.
- ___ 8. Select **OK**. The Select Drives Dialog displays.
- ___ 9. Use **Select** to select one or more drives to be updated.
- ___ 10. When your drive selection is complete, select **OK**. The Firmware-Update Dialog displays.

The picker takes the FMR tape out of the I/O station and places it into the selected drive or drives. The drive updates the firmware and unloads the FMR tape. The picker removes the FMR tape from the drive and returns it to the I/O station.
- ___ 11. Remove the FMR tape and store it for later use, such as to update code on a new or replacement tape drive.
- ___ 12. Verify that the firmware update completed successfully by checking the drive firmware version as described in “Determining current level of drive firmware” on page 9-10.
 - If the drive firmware version is the level recorded in Table 9-1 on page 9-10, the firmware update completed successfully.

Note: Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

 - If the drive firmware version is still lower than the level recorded in Table 9-1 on page 9-10, the firmware update failed. Retry the firmware update. If the error continues, contact your IBM Service representative.

Step 7. Update SAN Data Gateway firmware

Detailed instructions for updating the SAN Data Gateway firmware are listed in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*. The sections below include basic information on determining the current level of firmware on your SAN Data Gateway Module and updating that firmware, if necessary.

Note: Before removing or replacing the SAN Data Gateway Module, see the section about preserving the gateway's configuration in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.

Determining the level of firmware on the SAN Data Gateway Module

If the library has a SAN Data Gateway installed, it is highly recommended to install the software for the IBM StorWatch SAN Data Gateway Specialist to minimally monitor the SAN Data Gateway operation and for firmware update purposes. The software, which includes server and client software components, is located on the same website as the SAN Data Gateway firmware (<http://www.ibm.com/storage/1to>).

The server and client software can be located on the same PC or laptop and is easily started via access to the Programs folder on the desktop. By using the StorWatch Specialist, connectivity to the drives and library are graphically displayed thus helping to diagnose problems. The menu bar provides many diagnostics and functions as well as providing the capability to update SAN Data Gateway firmware. Details of operation are located in Chapter 3 of the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*. Installation information is located in Chapter 2.

Appendices A and B of the same document describes in detail how to access and test the SAN Data Gateway via the serial service port using a null modem serial cable. the particular HyperTerminal connectivity parameters are listed together with the Command Reference and descriptions.

To update the SAN Data Gateway firmware, complete the following steps:

- __ 1. Start the StorWatch Specialist server application if not already started.
- __ 2. Start the StorWatch Specialist client application if not already started.

Note: For information about starting the StorWatch Specialist server and client for Solaris, AIX, and other platforms, refer to the following web site at: <http://www.ibm.com/storage/1to>.

- To start the server using Windows NT
 - __ a. Click Start.
 - __ b. Click Programs —> StorWatch Specialist —> Server.
 - To start the server using Windows 2000
 - __ a. Click Start.
 - __ b. Click Programs —> StorWatch Specialist —> Client.
- __ 3. Connect the server (this is automatically done if the server and client are started and run on the same system).
 - __ 4. Log on to the server.
 - __ 5. To log on, type "Admin" in the Enter User Name field and type "password" (or the current password) in the Enter Password field, then click OK. Refer to Figure 9-1 on page 9-25 and Figure 9-2 on page 9-25.

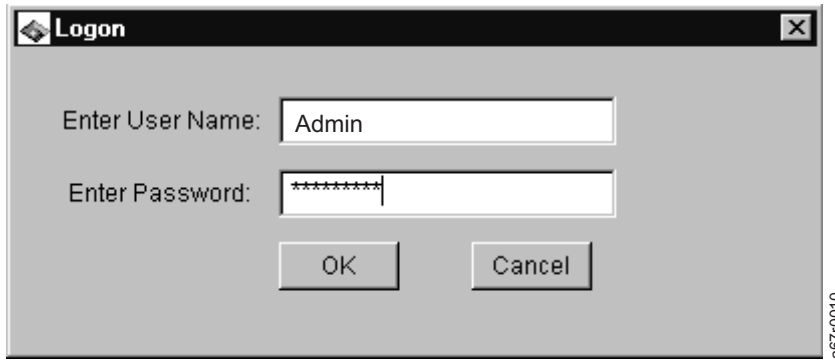


Figure 9-1. Logging on to the Server

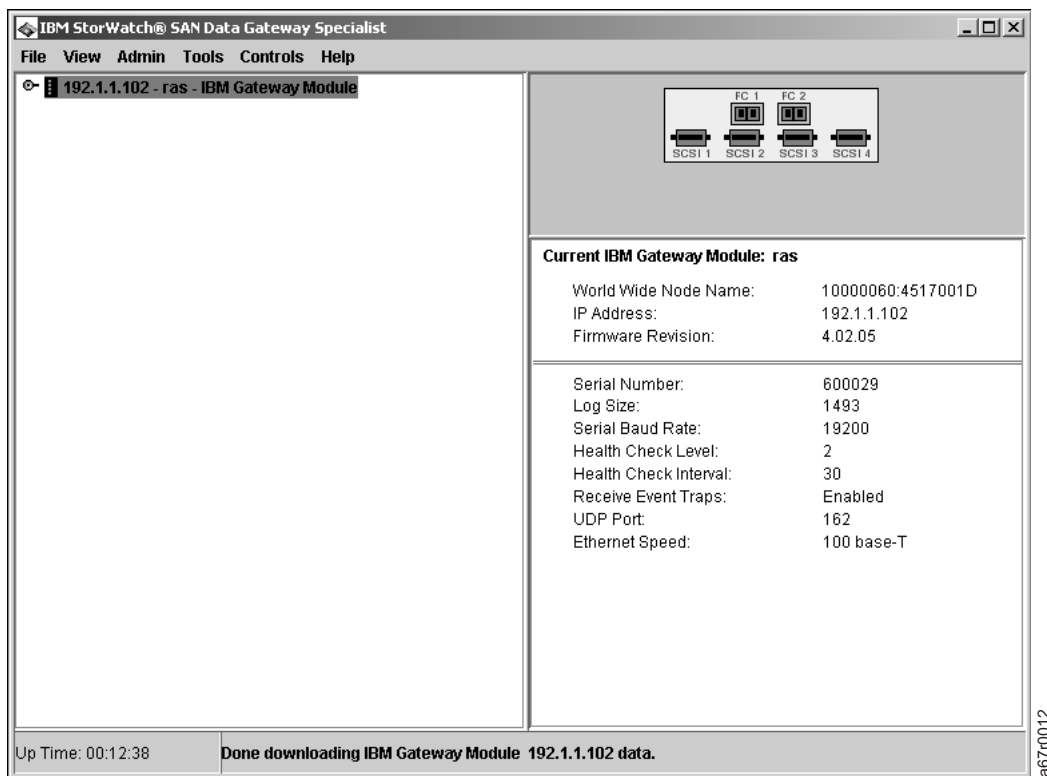


Figure 9-2. Initial Tree View

Note: Ensure the IBM Gateway Module is highlighted.

Updating SAN Data Gateway firmware

- ___ 1. Click on Controls pull down menu.
- ___ 2. Click on the Update Firmware selection.
- ___ 3. Locate the SAN Data Gateway code that was downloaded from <http://www.ibm.com/storage/1to>. Refer to Figure 9-3



Figure 9-3. Controls Menu

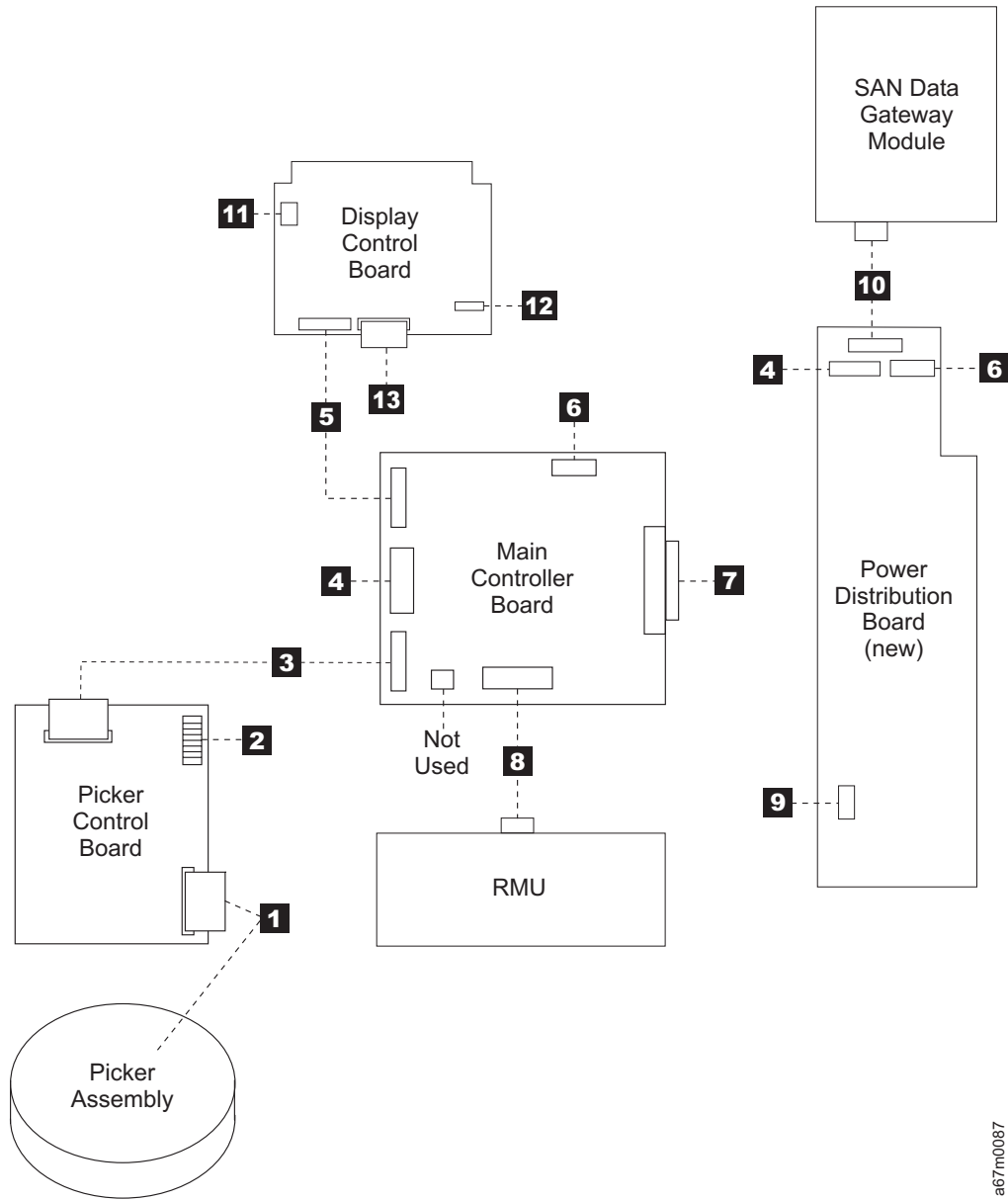
Reseating Cables

To reseat cables in the Tape Library perform the following steps:

1. Locate each cable by finding the key number in Table 9-2 and the corresponding key number in Figure 9-4 on page 9-28.
2. If access to the cable connection requires removal of covers or cartridge columns see the appropriate page in the Check, Adjust, Remove and Replace chapter.
3. Do not remove the cable connection. Press firmly on each connector to ensure the cable connector is firmly seated on the board or other component.

Table 9-2. Library Cables

Key	From	Remove, Replace Procedure	To	Remove, Replace Procedure
1	Picker Control Board	8-16	Picker Assembly	8-7
2	Picker Control Board	8-16	Rotary Axis Motor	8-14
3	Picker Control Board	8-16	Main Controller Board	8-4
4	Main Controller Board	8-4	Power Distribution Board (signal)	8-49
5	Main Controller Board	8-27	Display Control Board	8-47
6	Main Controller Board	8-4	Power Distribution Board (distribution)	8-49
7	Main Controller Board	8-4	Host Interface Board	8-45
8	Main Controller Board	8-4	RMU	8-39
9	Power Distribution Board	8-49	Y-Axis Motor Assembly	8-29
10	Power Distribution Board	8-49	SAN Data Gateway Module	8-41
11	Display Control Power Cable	8-47	Display Back Light	8-47
12	Display Control Board	8-47	Door Interlock Switch	8-58
13	Display Control Board	8-47	LCD Assembly	8-47



ae7m0087

Figure 9-4. Cable Diagram

Observing Library Robotics

Perform the following steps to observe the robotics within the library.

Tools that are required: *Phillips screwdriver, T10 Torx driver.*

Note: The picker assembly contains a charge coupled diode (CCD), it is not a laser device and presents no laser danger.

CAUTION:

When you are observing the Robotics action do not reach into the Robotics area while power switch is in the I position.

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Open the front door of the Library.
3. Remove the three screws **1** in front and four screws **2** in back, see Figure 9-5.
4. Remove top cover.
5. Close the front door securely.
6. Retry the operation that directed you to this procedure and view the library robotics through the holes in the top of the library.

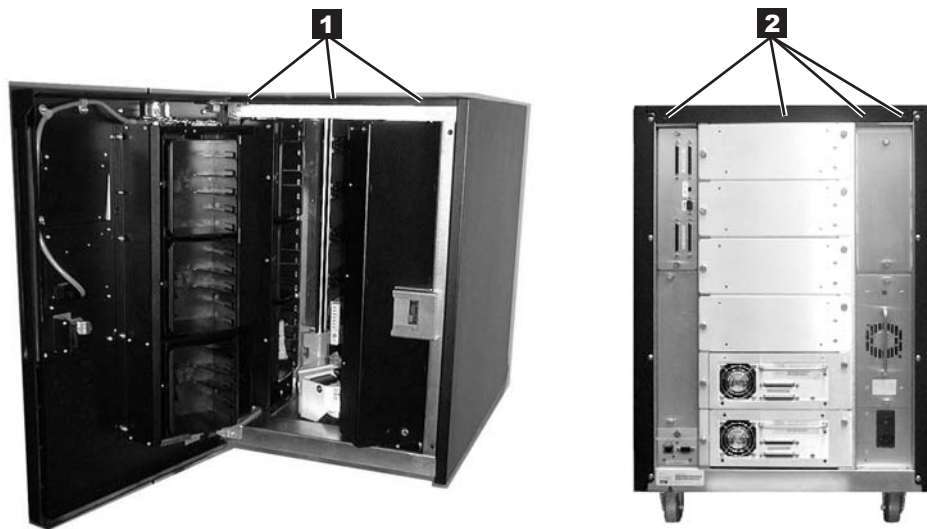


Figure 9-5. Top Cover Removal

SCSI or Fibre Channel Wrap Test

You are here because of a suspected SCSI or Fibre Channel connector or cable problem. See Table 15-1 on page 15-1 for part number of SCSI Wrap Tool and SCSI Terminator.

Tools that are Required: *SCSI or Fibre Channel Wrap Tool, the single-ended SCSI Terminator that was shipped with the drive.*

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. From the main menu select **Online/Offline** → **OK**.
3. Remove the SCSI or Fibre Channel Cables from the drive being tested.
4. Install correct SCSI Wrap Tool (HVD or LVD) to lower connector or install Fibre Channel Wrap Tool to the connector.
5. For SCSI, install the correct (HVD or LVD) SCSI Terminator to the upper connector. Alternative is to connect SCSI cable which has terminator at the end of daisy chain to the upper connector.
6. Start the SCSI or Fibre Channel Wrap Test by selecting **More** → **Service** → **Drives** → **Change Drive/OK** → **Diags** → **SCSI Wrap Test/Fibre Wrap Test** → **OK**.

Note: At **Change Drive** if you need to change drive address choose this key. If operator panel shows correct drive address choose **OK**.

7. If the wrap test failed go to “Removing the Tape Drive Sled” on page 8-4.
8. If the wrap test is successful suspect the SCSI or Fibre Channel Cables.
9. If cables do not fix the problem call your next level of support.
10. When problem is fixed reconnect all cables.
11. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

SAN Data Gateway Module Wrap Test

To perform wrap tests for the SAN Data Gateway Module, refer to the instructions in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.

Cleaning the Bar Code Reader Lens

If the bar code scanner is unable to read a bar code label, the lens on the reader may need to be cleaned. To clean the Bar Code Reader lens:

1. Ask customer to vary the Library Offline to host.
2. Open the library's front door.
3. Lift the Picker Assembly and gently rotate until the bar code reader lens is visible.
4. Wipe the bar code reader lens with a lint-free cloth. **DO NOT USE ALCOHOL OR ANY CLEANING LIQUID.**
5. Close the library's front door.
6. Ask customer to vary the Library Online to host.

Performing a Library Inventory

1. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.

8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583_Barcode_log.txt.
9. Select the Start radio button.
10. At the Monitor prompt, issue the **INV** command.
11. When the inventory completes, repeat Steps 10 and 11 two more times.
12. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.
13. View the created text as in Step 8 and verify that the number of cartridges inventoried and VOLSERS are the same between all three.

Chapter 10. Messages

Obtaining Tape Drive or Library Error Information at the Host	10-2
Obtaining Error Information From an RS/6000	10-2
Obtaining Service Information Message from an AS/400	10-8
AS/400 System with RISC Processor	10-8
Obtaining Error Information From a Sun System	10-9
Obtaining Error Information From an HP-UX System.	10-9

Obtaining Tape Drive or Library Error Information at the Host

IBM device drivers for the RS/6000 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

The AIX Tape and Media Changer Device Driver for the 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 lpg** to display a summary report, or type **errpt -a lpg** 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 = 3583]), refer to Figure 10-1 on page 10-3 and locate the SCSI sense data.
- For drive errors [Resource Name = **rmtn** (for example, rmt0) and Resource Type = LTO], refer to Figure 10-2 on page 10-4 and locate the SCSI sense data.
- For SCSI bus errors (not SCSI adapter errors), refer to Figure 10-3 on page 10-5 and Figure 10-4 on page 10-6 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 A-9 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 A-11.
- For SCSI adapter errors (not SCSI bus errors), use the maintenance package for the host.

Note: See Chapter 11, “Sense,” on page 11-1 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:  3583
Location:      40-60-00-6,0
VPD:
    Manufacturer.....IBM
    Machine Type and Model.....ULT3583-TL
    Serial Number.....IBM7810698
    Device Specific . (FW) .....5.14  (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
0C00 0000 A500 0001 1009 0101 0000 0000 0000 0000 7000 0400 0000 0046 0000 0000
4400 8100 0000 0000 0000 0000 0000 0200 4801 E300 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 10-1. AIX ERRPT Library Error Log Example

Table 10-1. AIX ERRPT Library Sense Data

Hex	Description
A5	SCSI Command
0001, 1009, 0101	Command Parameters
70	Byte 0 of Library Sense Data
04	Sense Key
4400	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
81	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:     40-60-00-2,0
VPD:
  Manufacturer.....IBM
  Machine Type and Model.....ULT3580-TD1
  Serial Number.....1300015078
  Device Specific.(FW).....25D4 (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 0000 7000 0300 0000 001C 0000 0000
5200 0700 20B0 0000 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 10-2. AIX ERRPT Drive Error Log Example

Table 10-2. 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 10-3. 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:  3583
Location:      40-58-00-0,1
VPD:
  Manufacturer.....IBM
  Machine Type and Model.....ULT3583-TL
  Serial Number.....IBM7810698
  Device Specific.(FW).....2.80

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 0000
```

Figure 10-4. 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 10-5. 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 AS/400

To gain access to the 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 AS/400 MAIN MENU displays.

AS/400 System with RISC Processor

1. Type STRSST (Start System Service Tools) command on the command entry line on the 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 3583 (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

The Sun system does not provide error logs for analysis; therefore, you must use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination. When you have located the error information, go to Chapter 5, “Start,” on page 5-1.

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 cartridge
- 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

The HP-UX system does not provide error logs for analysis; therefore, you must use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination. When you have located the error information, go to Chapter 5, “Start,” on page 5-1.

Chapter 11. Sense

Library Sense Data	11-2
Drive Sense Data.	11-6

Library Sense Data

Table 11-1. Sense Information Format

Bytes	Bits	7	6	5	4	3	2	1	0
0	Valid	70 = Existing Error 71 = Deferred Error							
1	Reserved								
2	Reserved					Sense Key (see Table 11-2)			
3 : 6	MSB	Information Bytes							LSB
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 : 11	MSB	Command Specific Bytes							LSB
12	Additional Sense Code (ASC) (see Table 11-3 on page 11-3)								
13	Additional Sense Qualifier (ASCQ) (see Table 11-3 on page 11-3)								
14	Service Action Code								
15	SKSV	C/D	Reserved			BPV	Bit Pointer		
16 17	MSB	Field Pointer							LSB

Table 11-2. 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 11-3. Additional Sense Codes and Qualifiers (Bytes 12 and 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
			90h	Library needs teaching.
04h	Hardware Error	15h	01h	A mechanical positioning error occurred.
			80h	The accessor dropped a cartridge.
			81h	The accessor could not pick a cartridge.
			83h	The accessor could not put 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	Gripper error.
			A0h	The accessor could not move on the vertical (Y) axis.
			A1h	The accessor could not home the vertical (Y) axis.
			B0h	The accessor could not move on the horizontal (X) axis.
			B1h	Could not home the horizontal (X) axis.
			C0h	The accessor could not move.
			E0h	The accessor lost power.
		44h	00h	Firmware detected an internal logic failure.
		53h	00h	A drive did not load or unload a tape.
			82h	Cannot lock the I/E station.
			83h	Cannot unlock the I/E station.
		83h	00h	Label too short, too long or duplicate.
			01h	Cannot read a barcode label due to a reader problem.
84h	00	Firmware error.		

Table 11-3. Additional Sense Codes and Qualifiers (Bytes 12 and 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.	
			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 accessor.	
			86h	Source of MOVE MEDIUM command cannot be accessor.	
			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 tape.	
			80h	Cartridge rejected in the Mailbox because it was not properly loaded.	
				Mailbox is open.	
			83h	02h	Cartridge magazine not installed.
				03h	Cell status and barcode questionable.
		04h		Drive not installed.	
		06h	Unit Attention	28h	00h
01h	Mailbox opened.				
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.	

Table 11-3. Additional Sense Codes and Qualifiers (Bytes 12 and 13) (continued)

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 11-4. 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 11-4. 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	00 - No additional sense — The flags in the sense data indicate the reason for the command failure						
	00	01	01 - Filemark detected — A Read or Space command terminated early due to an FM. The FM flag is set.						
	00	02	02 - EOM — A Write or Write File Marks command failed because the physical end of tape was encountered, or a Read or Space command encountered EOM. The EOM flag is set						
	00	04	04 - BOM — A space command ended at Beginning of Tape. The EOM bit is also set						
	00	05	05 - EOD — Read or Space command terminated early because End of Data was encountered						
	00	16	16 - Operation in progress						
	04	00	00 - Cause not reportable — A cartridge is present in the drive, but it is in the process of being unloaded						
	04	01	01 - Becoming Ready — A media access command was received during a front panel initiated load or an immediate reported load command						
	04	02	02 - Initializing Command Required — A cartridge is present in the drive, but is not logically loaded. A Load command is required						
	04	03	03 - Manual Intervention Required — A cartridge is present in the drive but could not be loaded or unloaded without manual intervention						
	04	12	12 - Logical Unit Not Ready, Offline						
	08	01	01 - Logical Unit Communication Failure						
	09	00	00 - Track Following Error (Servo)						
	0C	00	00 - Write Error — A Write operation has failed. This is probably due to bad media, but may be hardware related						
	11	00	00 - Unrecovered Read Error — A Read operation failed. This is probably due to bad media, but may be hardware related						
	14	00	00 - Recorded Entity Not Found — A space or Locate command failed because a format violation prevented the target from being found.						
	14	03	03 - End Of Data not found — A Read type operation failed because a format violation related to a missing EOD data set						
	17	01	01 - Recovered Data with Retries						
	1A	00	00 - Parameter list length error — The amount of parameter data sent is incorrect						
	20	00	00 - Invalid Command Operation Code — The Operation Code in the command was not a valid Operation Code						
	24	00	00 - Invalid field in CDB — An invalid field has been detected in a Command Descriptor Block						
	25	00	00 - LUN not supported — The command was addressed to a non-existent logical unit number						
	26	00	00 - Invalid Field in Parameter List — An invalid field has been detected in the data sent during the data phase						
	27	00	00 - Write Protect — A Write type operation has been requested on a cartridge which has been write protected						
	28	00	00 - Not Ready to Ready Transition — A cartridge has been loaded successfully into the drive and is now ready to be accessed						
	28	01	01 - Import or Export Element Accessed						
	29	00	00 - Reset — The drive has powered on, received a reset signal or a bus device reset signal since the initiator last accessed it						
	29	04	04 - Device Internal Reset						
	(Continued on next page)								

Table 11-4. 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						
2A	01 - Mode Parameters Changed — The Mode parameters for the drive have been changed by an initiator other than the one issuing the command							
2C	00 - Command Sequence Error							
2F	00 - Commands Cleared by Another Initiator				00 - Incompatible Media Installed — A write type of command was 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							
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	05 - Cannot Write Medium, Incompatible Format							
30	07 - Cleaning Failure — A cleaning operation was attempted, but could not be completed for some reason							
31	00 - Media format corrupted — Data could not be read because the format on tape 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							
3B	0C - Position Past Beginning of Medium — A command that required the medium to be at BOP was attempted when the medium was not at BOP (e.g., Set Capacity)							
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							
3F	03 - Inquiry Data has Changed							
3F	0E - Reported LUNs Data has Changed							
3F	0F - Echo Buffer Overwritten							
40	xx - Diagnostic failure — A diagnostic test has failed. The xx (ASCQ) is a vendor specific code indicating the failing component.							
41	00 - Data Path Failure							
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							
48	00 - Initiator Detected Error Message Received							
49	00 - Invalid Message Error							
4A	00 - Command Phase Error							
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							
	(Continued on next page)							

Table 11-4. 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							
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 tape 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							
53	02 - Media Removal Prevented — An Unload command has failed to eject the cartridge because media removal has been prevented							
5A	01 - Operator Medium Removal Request							
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							
A3	01 - OEM Vendor-Specific							
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 tape 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 tape. The least significant bit reflects the current physical direction. A 0 means that the current direction is away from the physical beginning of the tape. A 1 means that the current direction is towards the physical beginning of the tape.
12. Relative LPOS fields (Bytes 30–33) reports the current physical position on the tape.
13. SCSI Address field (Byte 34) reports the SCSI Bus Address for the drive. Values returned range from 00h to 0Fh.

Chapter 12. Power

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Overview

This chapter describes the power system for the Ultrium Scalable Tape Library.

ac and dc Power

The Tape Library contains an ac Input Power Module **3** that requires 110 V or 230 V, 10 Amperes single phase ac power. The ac Power Module supplies ac to the dc Power Supplies **1** and all Tape Drive Sleds **4** in the Library.

Standard Tape Library configuration requires one dc Power Supply which generates +5 V dc and +12 V dc to be used in the Library. An optional dc Power Supply can be installed to provide dc power redundancy in the Library. When two dc Power Supplies are installed, one output switches on in the event the other output should fail. The dc Power Supplies are auto-ranging and can accept either 110 or 230 V ac.

Each Drive Sled has a built-in dc Power Supply and only requires ac input. This dc Power Supply is also auto-ranging and can accept either 110 or 230 V ac.

Figure 12-1 shows the locations of the ac Power Module and the dc Power Supplies in the Tape Library.

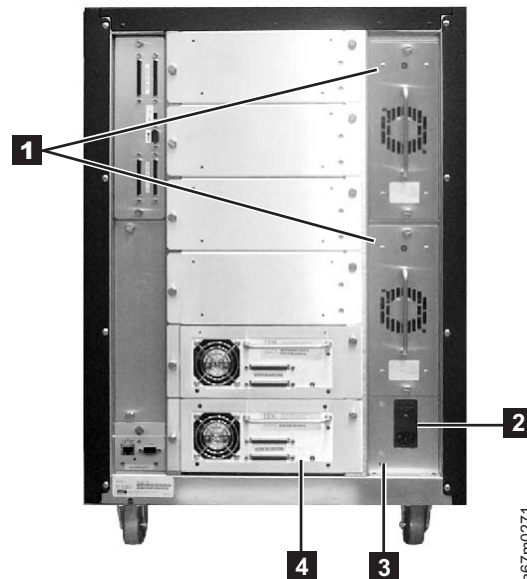


Figure 12-1. ac Power Module and dc Power Supplies locations. Figure shows a converted library.

ac and dc Power Distribution

The AC Input Power Module distributes ac to all Tape Drive Modules and the DC Power Supplies through the Power Distribution PCBA. The output of the AC Input Power Module is controlled by a Switch and protected by two 5A fuses. The DC Power Supplies and all Tape Drive Modules are plugged into the Power Distribution PCBA with self-docking or blind-mate connectors.

Each DC Power Supply has a built-in switch that is activated as the DC Power Supply is plugged into the Power Distribution PCBA. ac voltage is immediately available to the DC Power Supply as soon as the connection is made.

There are two versions of the DC Power Supplies, with each requiring a corresponding Power Distribution PCBA to operate. Physically, these two types of DC Power supplies look the same. You need to order the correct one for the library. **The library will not power up if the DC power supply and the Power Distribution PCBA are not compatible:**

- Type I dc power supply provides +5 Vdc and +12 Vdc to the Power distribution PCBA to be distributed throughout the library. This DC Power Supply is used in older libraries.
- Type II dc power supply only provides +12 Vdc to its associated Power Distribution PCBA. The Power Distribution PCBA generates +5 Vdc from the +12 Vdc and distributes these two voltages throughout the library. This DC Power Supply is used in newer libraries to handle additional appliances, such as the SAN Data Gateway Module.

When two DC Power Supplies are installed in the library, their outputs are connected together. If one of these DC Power Supplies fails, the library can still operate normally. Each DC Power Supply also has an LED indicator in the back to indicate its status:

- Green indicates that the power supply is operating normally
- Red indicates a failures that requires a replacement

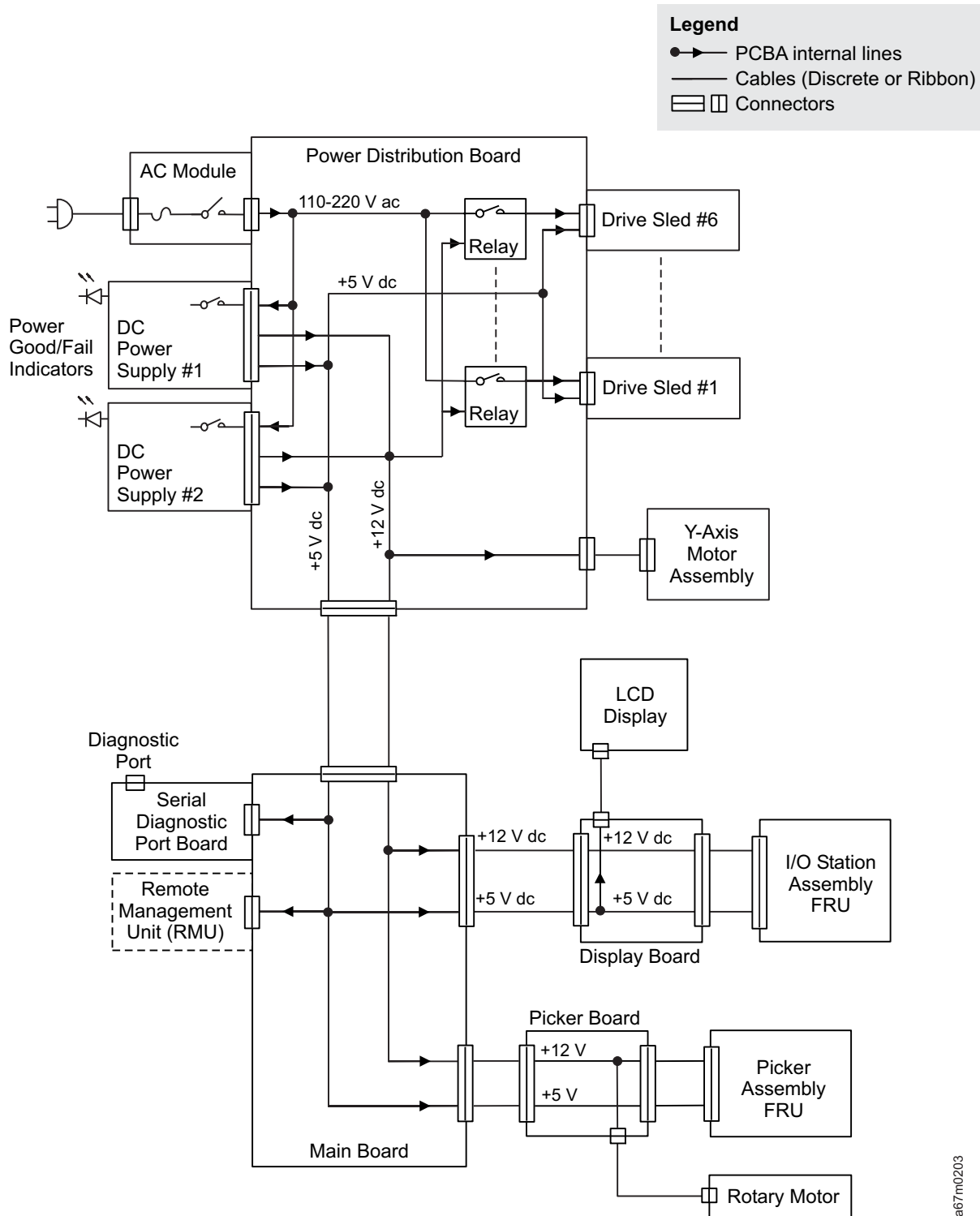
The operator panel presents a message when this condition occurs. The failing DC Power Supply can be removed and replaced without interrupting the library's operations.

As each Tape Drive Module is plugged into the Power Distribution PCBA, its Drive Communication PCBA receives +5 Vdc power from the Power Distribution PCBA. Firmware on the Drive Communication PCBA attempts to communicate with the library firmware. After this communication is established, the library firmware activates a relay that provides ac power to the Tape Drive Module. Options are provided through the operator panel menus to remove and restore ac power to the Tape Drive Module during a service call.

Use the following diagrams for ac and dc power distribution within the library:

- “ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature” on page 12-4. Note that each DC Power Supply generates +5 Vdc and +12 Vdc.
- “ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature” on page 12-5. Note that each DC Power Supply generates only +12 Vdc and there is a dc-to-dc converter on the Power Distribution PCBA that generates +5 Vdc from the +12 Vdc.

ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature



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Figure 12-2. ac and dc power distribution for Type I power supply in a library with the Multi-Path feature

ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature

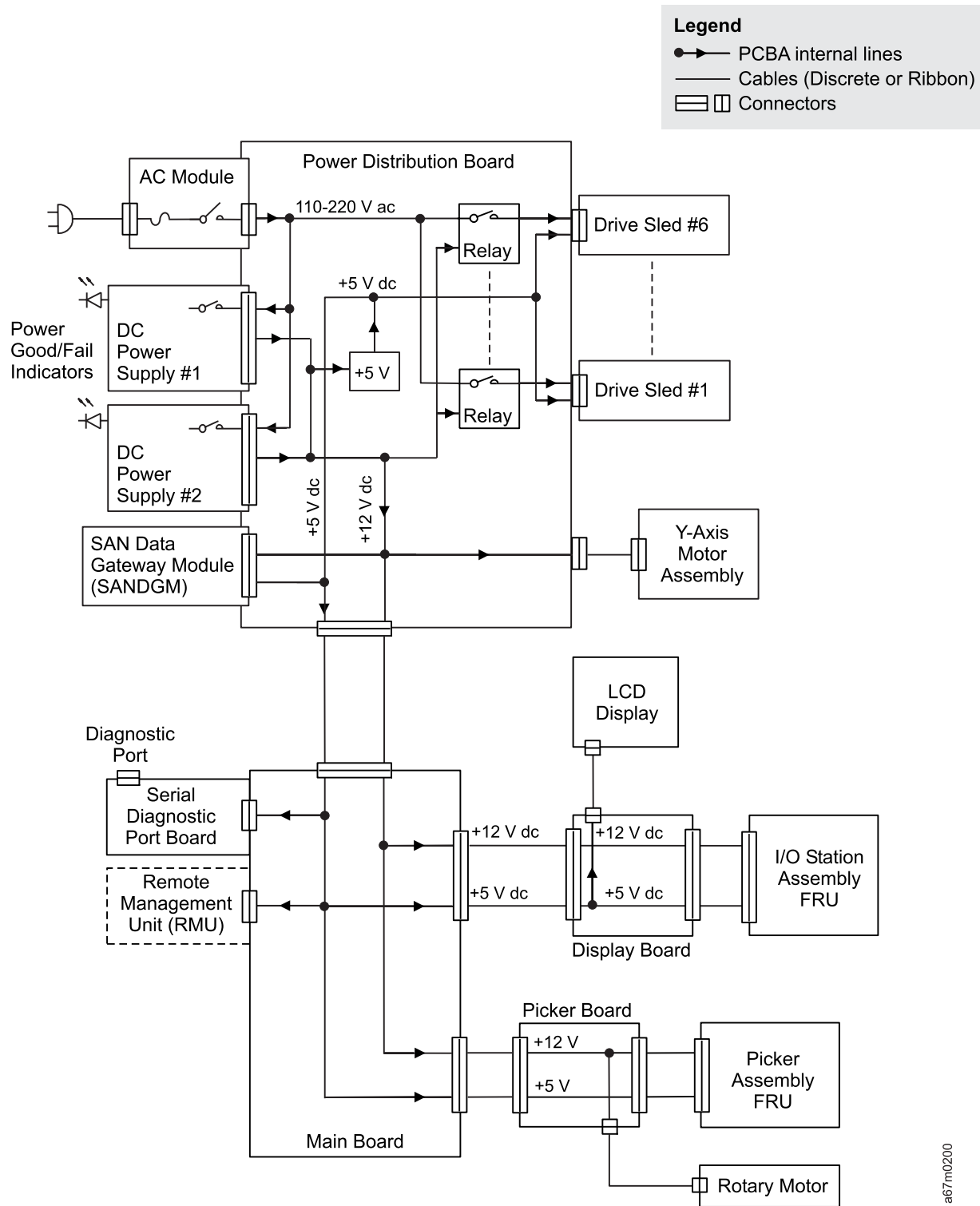


Figure 12-3. ac and dc power distribution for Type II power supply in a library with the Multi-Path feature

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Chapter 13. Cable

Overview	13-2
Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature	13-3
Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature	13-4

Overview

This chapter shows the interconnections between major components in the Ultrium Scalable Tape Library.

The following diagrams show the connector and cable designations. The designation **J** used in the diagrams means connectors on electronic cards or major assemblies.

- “Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature” on page 13-3.
- “Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature” on page 13-4

Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature

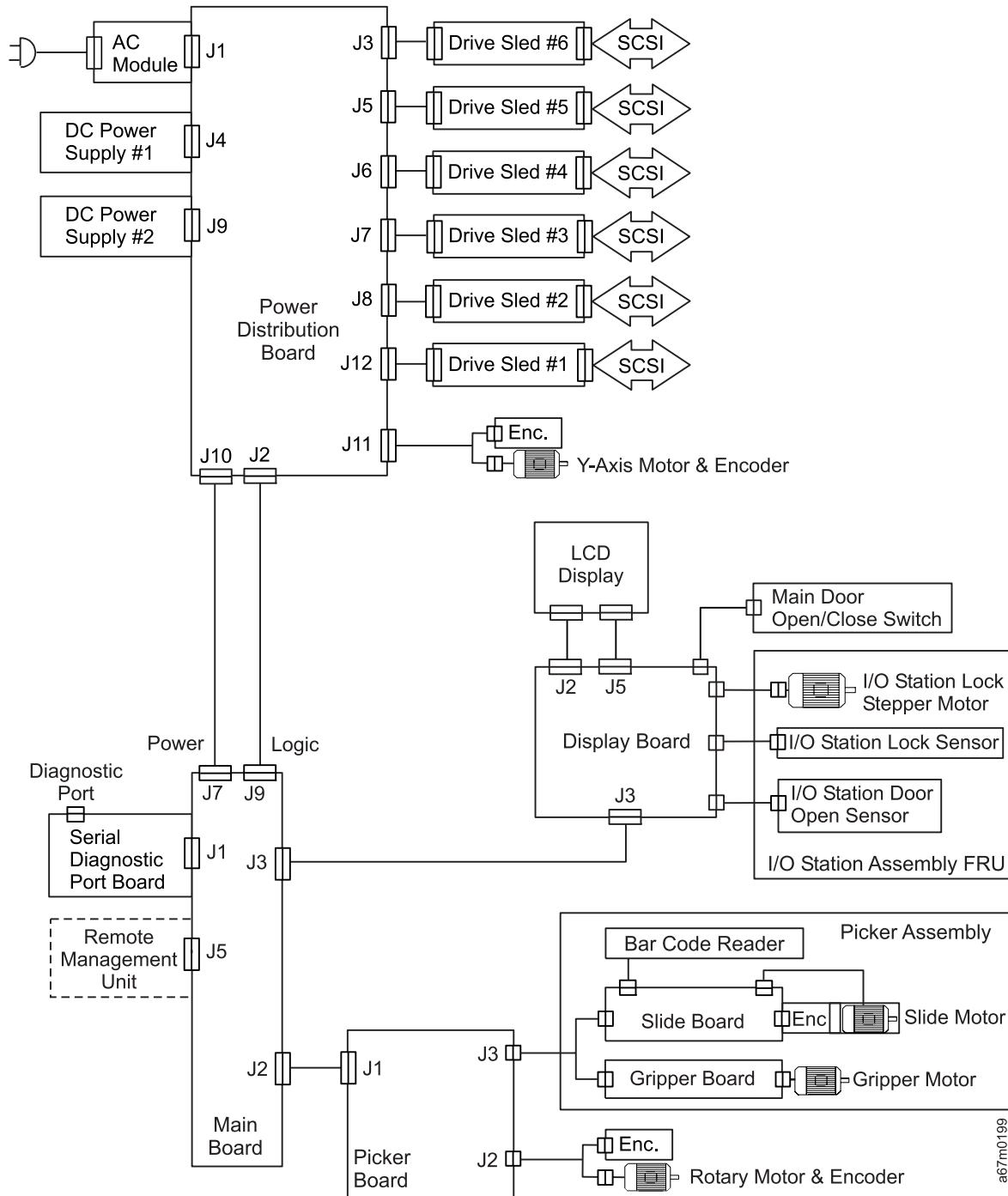


Figure 13-1. Cable diagram for Type I power distribution PCBA in a library with the Multi-Path feature

Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature

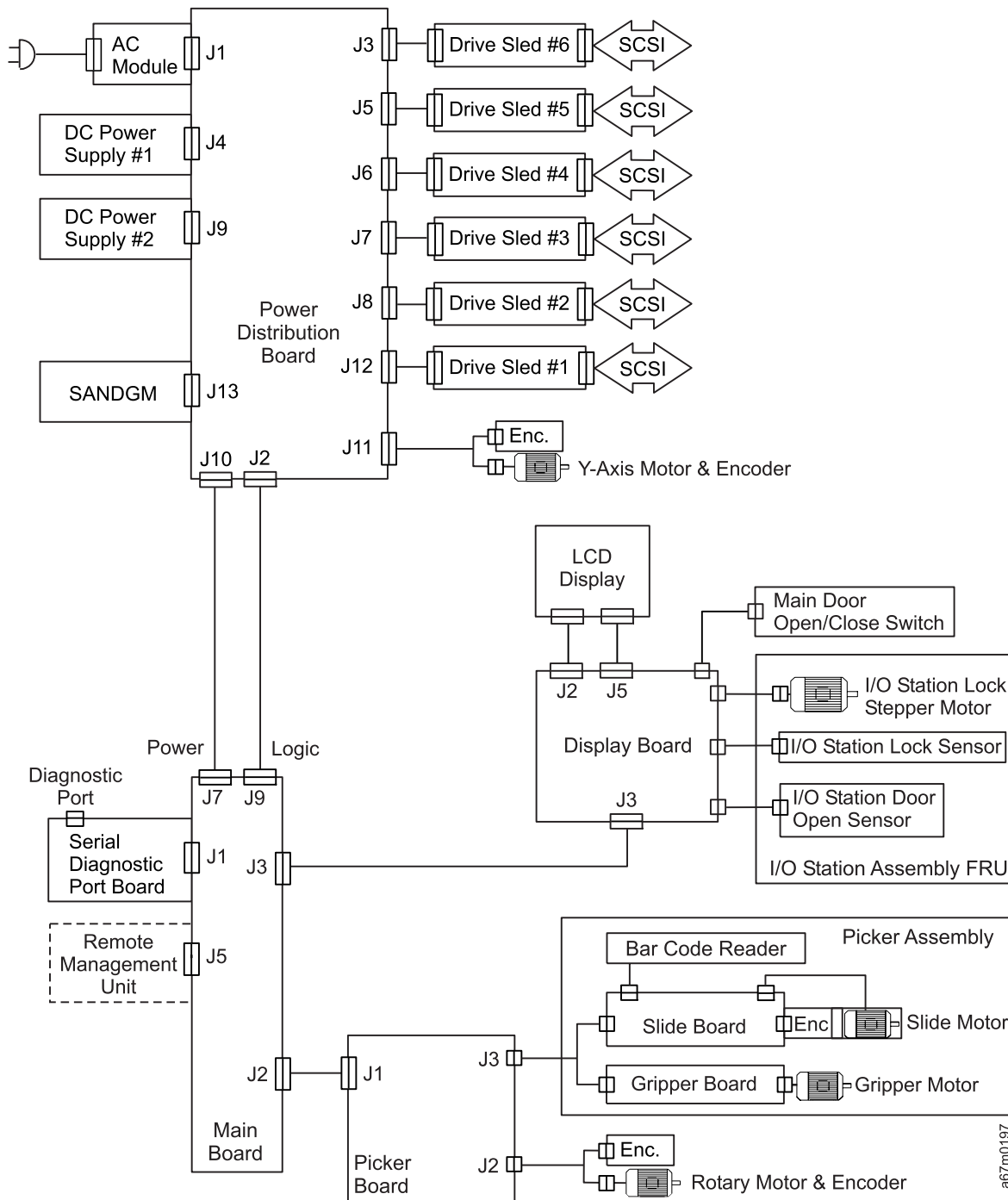


Figure 13-2. Cable diagram for Type II Power Distribution PCBA in a library with the Multi-Path feature

Chapter 14. Installation

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

To ensure optimum performance, obtain the latest level of firmware from the web by visiting <http://www.ibm.com/storage/ltu>. Be sure to verify that you have the latest firmware installed on your machine before you contact IBM for any necessary technical support.

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

To install the Ultrium Scalable Tape Library, complete the following steps. For more information, refer to the instructions for each step in this chapter.

- “Step 1. Unpack the Library” on page 14-2
- “Step 2. Verify Shipment Inventory” on page 14-3
- “Step 3. Remove Packaging from Picker Assembly” on page 14-4
- “Step 4. Turn on Power” on page 14-5
- “Step 5. Run the Verify Test” on page 14-7
- “Step 6. Turn off Power” on page 14-9
- “Step 7. Install as Stand-Alone Unit or in Rack” on page 14-10
- “Step 8. Install Optional Features” on page 14-25
- “Step 9. Reposition Drives for Partitioning” on page 14-33
- “Step 10. Install Cables and Terminators” on page 14-34
- “Step 11. Turn on Power” on page 14-40
- “Step 12. Partition the Library” on page 14-41
- “Step 13. Set SCSI and FC IDs” on page 14-42
- “Step 14. Add Control Paths” on page 14-45
- “Step 15. Install Additional Options” on page 14-47
- “Step 16. Import Cleaning Cartridge(s)” on page 14-52
- “Step 17. Populate the Library with Data Cartridges” on page 14-54
- “Step 18. Configure the RMU” on page 14-55
- “Step 19. Verify Firmware Levels” on page 14-59
- “Step 20. Install a SCSI Host Adapter Card (if required)” on page 14-64
- “Step 21. Install Device Drivers and Backup Software” on page 14-64
- “Step 22. Configure the Tape Library to the Server” on page 14-64
- “Step 23. Store Manuals and Documentation” on page 14-64

Step 1. Unpack the Library

To unpack the Ultrium Scalable Tape Library, use the sling (see **1** in Figure 14-1) that is shipped with the Ultrium Scalable Tape Library to lift and move the library into place. It is recommended that four people use the handles **2** of the sling to lift the library. For additional information, read the printed instructions located on the shipping container.



Figure 14-1. The sling for lifting the Ultrium Scalable Tape Library

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

Step 2. Verify Shipment Inventory

- ___ 1. Front door key (taped to the back of the library)
- ___ 2. Power cord (for the appropriate cord for your country or region, see “Power Cords” on page 15-4)
- ___ 3. Up to six optional Ultrium Tape Drives (SCSI and/or Fibre Channel)
- ___ 4. Drive-to-drive SCSI cable (0.4 m) and terminator with each SCSI drive ordered
- ___ 5. Host-to-device SCSI bus cable (4.5 m or 5 m as specified or ordered)
- ___ 6. Device-to-device SCSI bus cable (0.7 m) for connection between the SCSI host interface board and the first SCSI drive
- ___ 7. LVD single-connector SCSI wrap tool or HVD/DIFF single-connector SCSI wrap tool, or both
- ___ 8. Serial cable (straight through; that is, the cable’s wires connect to identical connector pins on each end)
- ___ 9. Optional San Data Gateway Module (if ordered)
- ___ 10. Optional native Fibre Channel cable (if ordered)
- ___ 11. Optional native Fibre Channel wrap tool (if ordered)
- ___ 12. IBM LTO Ultrium Data Cartridge
- ___ 13. IBM LTO Ultrium Cleaning Cartridge
- ___ 14. Rack mount Kit (feature code 8006)
- ___ 15. Device driver kit that includes:
 - CD that contains the Open Systems Device Drivers
 - Copy of the *IBM Ultrium Device Drivers Installation and User’s Guide*

Note: Device driver support is subject to change. For information about the latest supported device drivers (and to download them), see “Supported Device Drivers” on page 1-31.

- ___ 16. *Ultrium Scalable Tape Library Quick Reference*
- ___ 17. *Ultrium Scalable Tape Library Setup and Operator Guide* (this guide)
- ___ 18. *Ultrium Scalable Tape Library Maintenance Information*
- ___ 19. *IBM Externally Attached Devices Safety Information* manual

Note: To ensure that you have the latest publications and the latest firmware, visit the web at <http://www.ibm.com/storage/1to>.

Step 3. Remove Packaging from Picker Assembly

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

Note: Attach the band to the library key ring for safe keeping. The band will need to be reinstalled if the library is relocated.

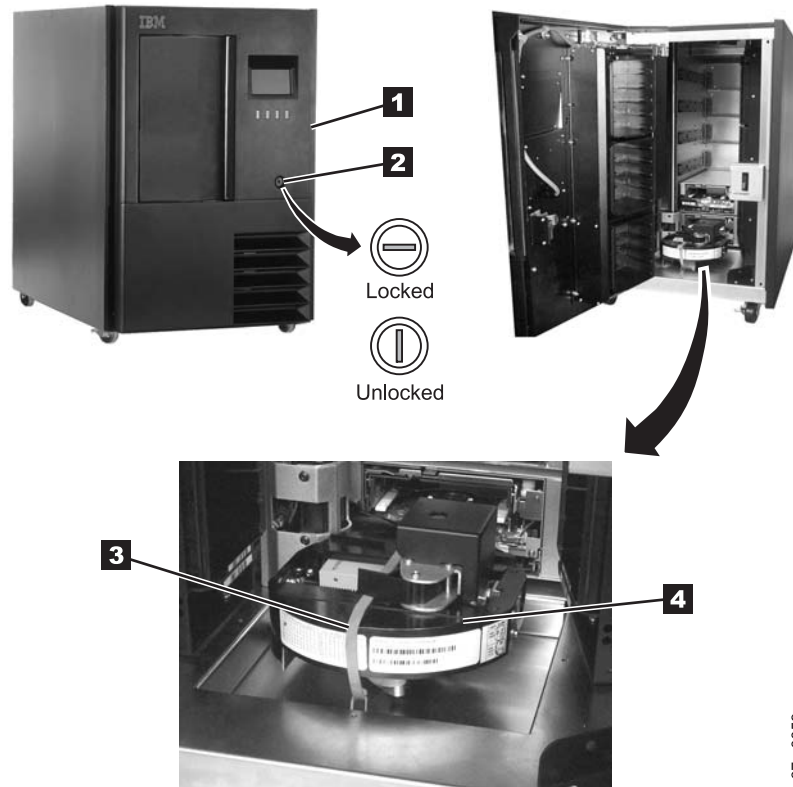


Figure 14-2. Installing a stand-alone library

3. Close the front door securely.

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Step 4. Turn on Power



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

1. Ensure that the power switch is set to off by pressing O on the power switch (see **1** in Figure 14-3).



Figure 14-3. Main power switch

2. Plug the power cord into the Ultrium Scalable Tape Library, then plug the other end into a grounded electrical outlet.
3. Push I on the power switch to turn on the power. The library takes a few minutes to perform initialization.
4. Inspect the rear panel to ensure that all drive LEDs are green.
 - If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green:
 - a. Power off the library.
 - b. Loosen the two thumbscrews on a drive.
 - c. Pull the drive part way out of the library.
 - d. Push the drive back into the library.
 - e. Tighten the two thumbscrews on the drive.
 - f. Power on the library.
 - If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green, contact your Service Representative.

5. The library firmware automatically initializes and starts the inventory/teach process. The Operator Control Panel display changes to reflect which power-on operation is in progress. The library initially comes up in offline mode as shown in the topmost screen in Figure 14-4, and then automatically changes to online mode as shown in the middle screen. **Be sure to wait until the library is in online mode before pressing any buttons.** When prompted to change to offline mode (**1** in Figure 14-4), press the button **2** below the **Online/Offline** softkey. Follow the instructions on the screen, then push the button **2** below the **OK** softkey as shown in the bottommost screen in Figure 14-4.

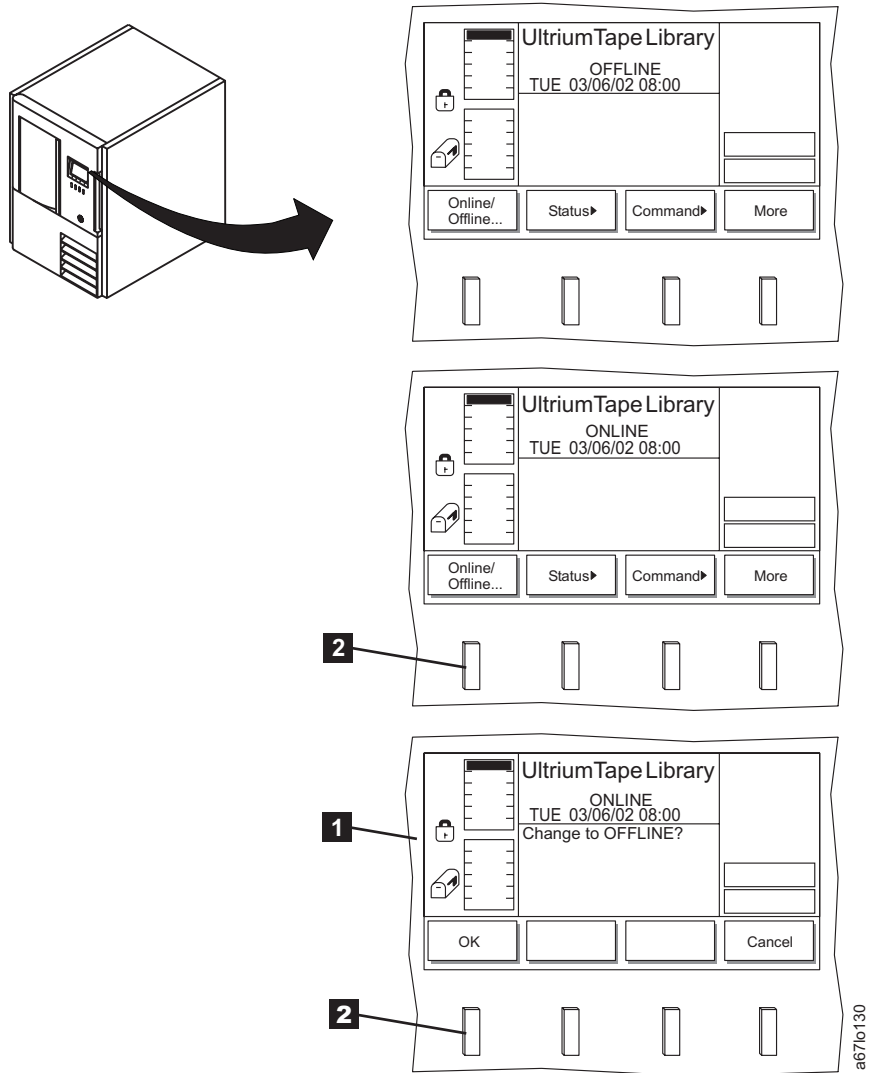


Figure 14-4. Operator panel

Step 5. Run the Verify Test

The Verify Test runs the following tests on the library:

- Power On Self Test (POST)
- FAST Read/Write drive test
- A test of the robot range of motion
- A bar code scanner test



Shortcut: Main Menu (initial screen) → More → Service → Library → Exercise → Verify Test

1. Navigate to the Service Menu. For instructions, see “Accessing the Service Menu” on page 4-9.
2. Press the button below the **Library** softkey. The Library Submenu is displayed (see Figure 14-5).

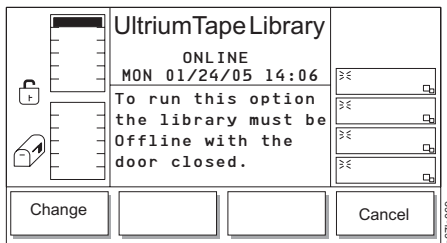


Figure 14-5. Library Submenu

3. Press the button below the **Change** softkey to change to initiate the change to Offline mode. Then, press the button below the **OK** softkey.
4. Press the button below the **Exercise** softkey . The Exercise Submenu is displayed.
5. Press the button below the **Verify Test** softkey. The Verify Test Dialog is displayed (see Figure 14-6).

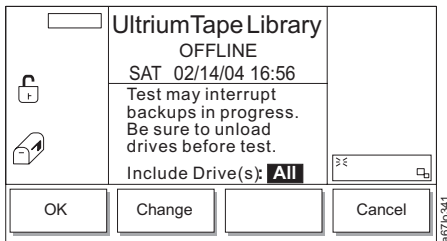


Figure 14-6. Verify Test Dialog

6. In the Verify Test Dialog's Include Drive(s) field, press the button below the **Change** softkey to select **ALL**, if necessary.
7. When the correct value is selected, press the button below the **OK** softkey. The Verify Test Scratch Tape Dialog displays (see Figure 14-7 on page 14-8).

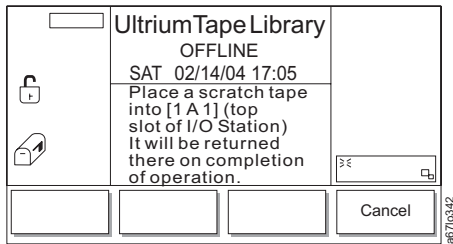


Figure 14-7. Verify Test Scratch Tape Dialog

8. Open the I/O Station.
 9. Insert a scratch tape into the top slot of the I/O Station.
- Notes:**
- a. Refer to Table 1-3 on page 1-13 to determine the type of drives resident in the library.
 - b. Refer to the cartridge compatibility table on Table 1-3 on page 1-13 for information on which type of cartridge to use.
 - c. If a cartridge is already in the slot, the Operator Control Panel displays a warning message indicating that the slot contains an unknown tape. Check to ensure that it is a scratch tape before proceeding.
10. Close the I/O Station and the library will execute the TEACH and INVENTORY procedures.
 11. When the diagnostic begins, the Diagnostic In Progress Screen displays (see Figure 14-8).

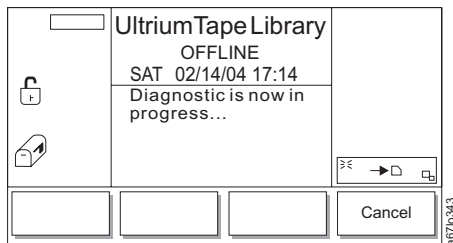


Figure 14-8. Diagnostic In Progress Screen

The library runs a Power On Self Test (POST) to verify the hardware is working properly. Then the library ensures communication with the drives. If the drive has a cartridge loaded, the library moves the cartridge to its home slot. The library then reads the bar code on the scratch tape and moves the scratch tape to the drive and runs a FAST Read/Write test on the tape. The tape is then moved back to slot 1A1, and the bar code is read a second time and compared with the earlier reading.

12. When the tape is returned to the I/O Station, the Command Now Complete Screen displays (see Figure 14-9).

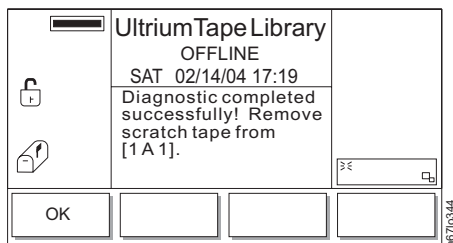


Figure 14-9. Command Now Complete Screen

13. Press the button below the **OK** softkey to return to the Exercise Submenu.

14. Press the button below the **OK** softkey, then press the button below the **Back** softkey to return to the Main Menu.
-

Step 6. Turn off Power

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

1. Ensure that all cartridges are removed from the drives and are stored in the library's storage slots.
2. Push **O** on the main power switch (**1** in Figure 14-3 on page 14-5) to turn off the power. Power is removed from the tape library.

Step 7. Install as Stand-Alone Unit or in Rack

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

- “Installing a Stand-Alone Library”
- “Installing the Library into a Rack (optional)” on page 14-12

Installing a Stand-Alone Library

Before you begin the installation, complete the following tasks.

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

Performing the Installation Procedure



> 55 kg
(121.2 lb)



CAUTION:

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

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

1. If you are installing the library on a raised floor, place the hole cutout under the rear of the frame.

2. Lock the two front casters **1** in place by turning the latch **2** counterclockwise (see Figure 14-10).

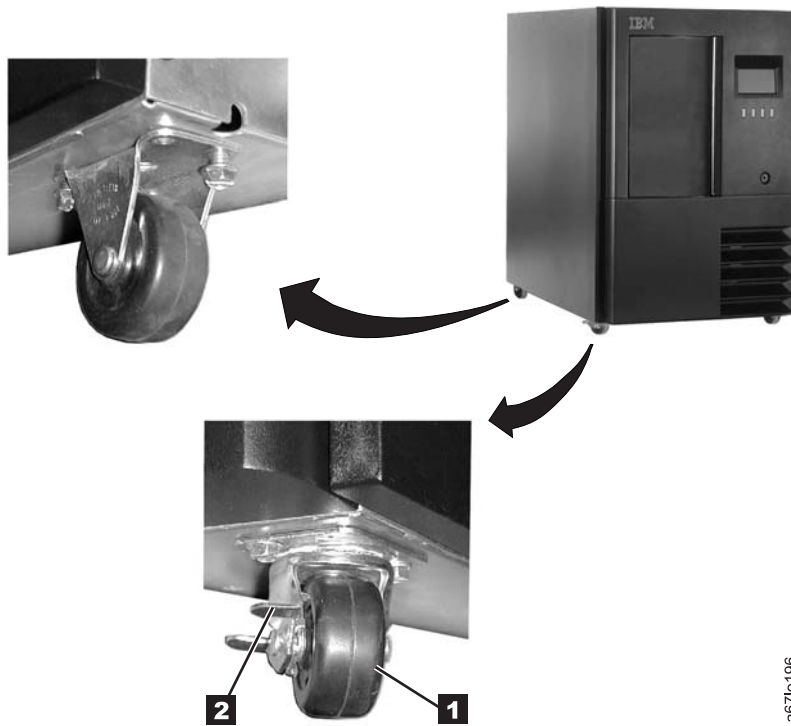


Figure 14-10. Locking front casters

3. Perform one of the following:
 - If you intend to install one or more optional features, go to “Step 8. Install Optional Features” on page 14-25.
 - If you do not intend to install an optional feature, go to “Step 9. Reposition Drives for Partitioning” on page 14-33.

Installing the Library into a Rack (optional)

Attention: Review the information in “Rack Safety” before installing the library into a rack.

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

Note: Before you begin the installation, familiarize yourself with the installation instructions and understand the requirements for connecting cables between the server, the library, and the tape drives.

To install the Ultrium Scalable Tape Library, complete the following:

- ___ 1. “Review the Guidelines” on page 14-14
- ___ 2. “Verify the Rack Mount Kit” on page 14-15
- ___ 3. “Install the Rack Mount Hardware” on page 14-17
- ___ 4. “Remove Components to Reduce Library Weight” on page 14-21
- ___ 5. “Place the Library into the Rack” on page 14-23
- ___ 6. “Replace Library Components” on page 14-24

Rack Safety

The following general safety information should be used for all rack mounted devices.

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 cabinet.**
- **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.**
- **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.**

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 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 comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 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)

Tools Required

- Phillips screw driver
- Flat head screw driver

Review the Guidelines

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

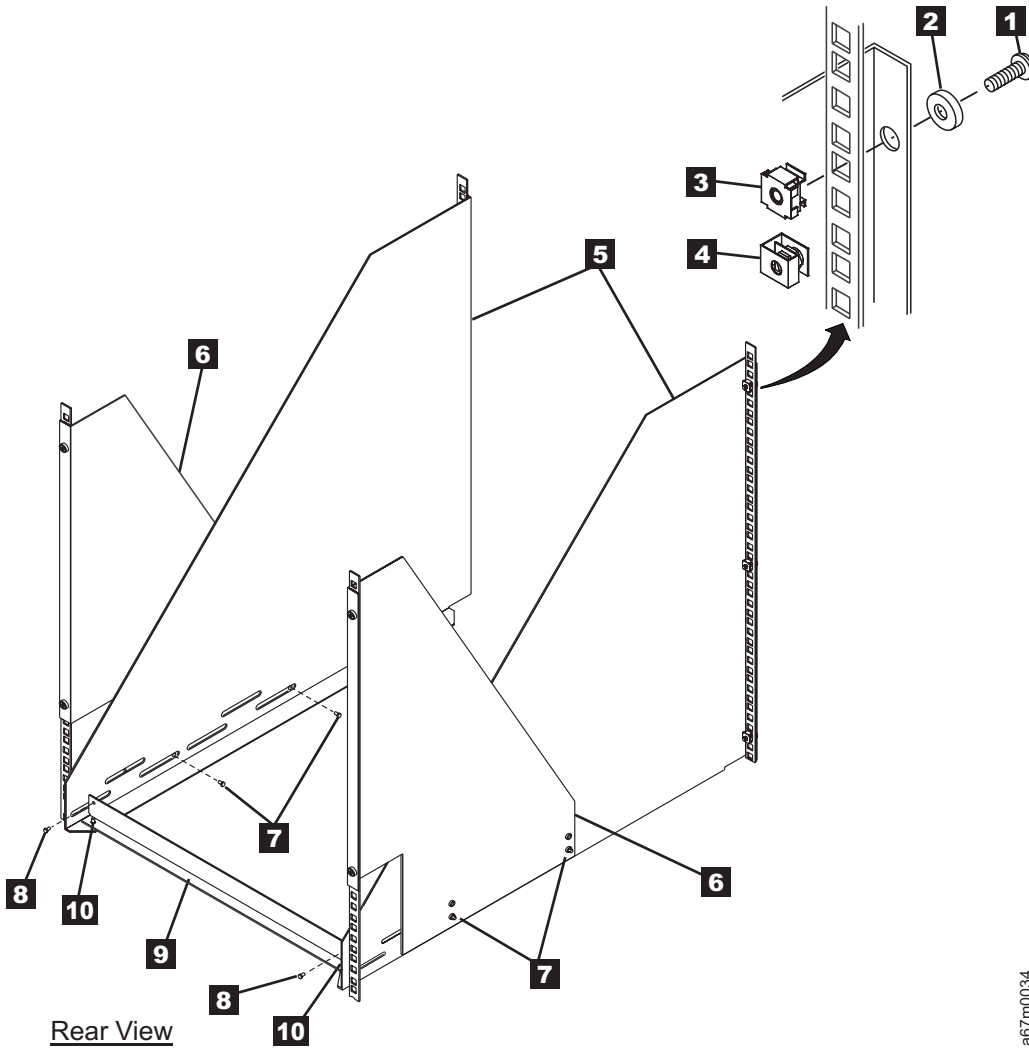
- Do not install the Ultrium Scalable Tape Library in a rack where the maximum internal ambient temperature will exceed 38°C.
- Do not install the Ultrium Scalable Tape Library in a rack where the airflow is compromised. Do not block or otherwise restrict airflow to the power supply front or rear vents.
- When installing the Ultrium Scalable Tape Library into a rack, ensure that a hazardous condition is not created due to uneven mechanical loading. If the rack has a stabilizer, it must be firmly attached before you install or remove the library.
- The Ultrium Scalable Tape Library requires 6 amps of power with an input of 100 Vac or 3 amps with an input of 240 Vac. Connect the library to the power supply circuit so that the overloading of circuits does not compromise the supply wiring or overcurrent protection.
- Ensure that the Ultrium Scalable Tape Library is properly grounded when in the rack (see step 2 on page 14-23).

Verify the Rack Mount Kit

1. Open the shipping carton and remove the components of the kit (see Figure 14-11 on page 14-16).
2. Verify that you received the parts listed in Table 14-1.

Table 14-1. Components of Rackmount Kit

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



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Figure 14-11. Components of the rack mount kit

Install the Rack Mount Hardware

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

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

Note: Each U is 4.45 cm (1.75 in.) and is usually marked by three holes in the rack (see Figure 14-12).

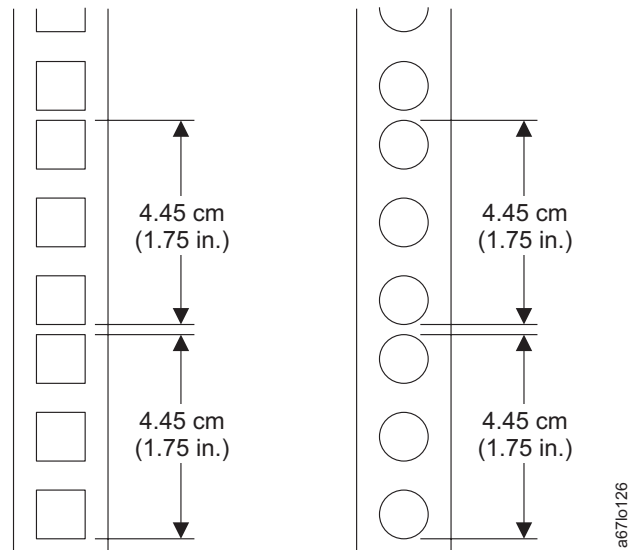


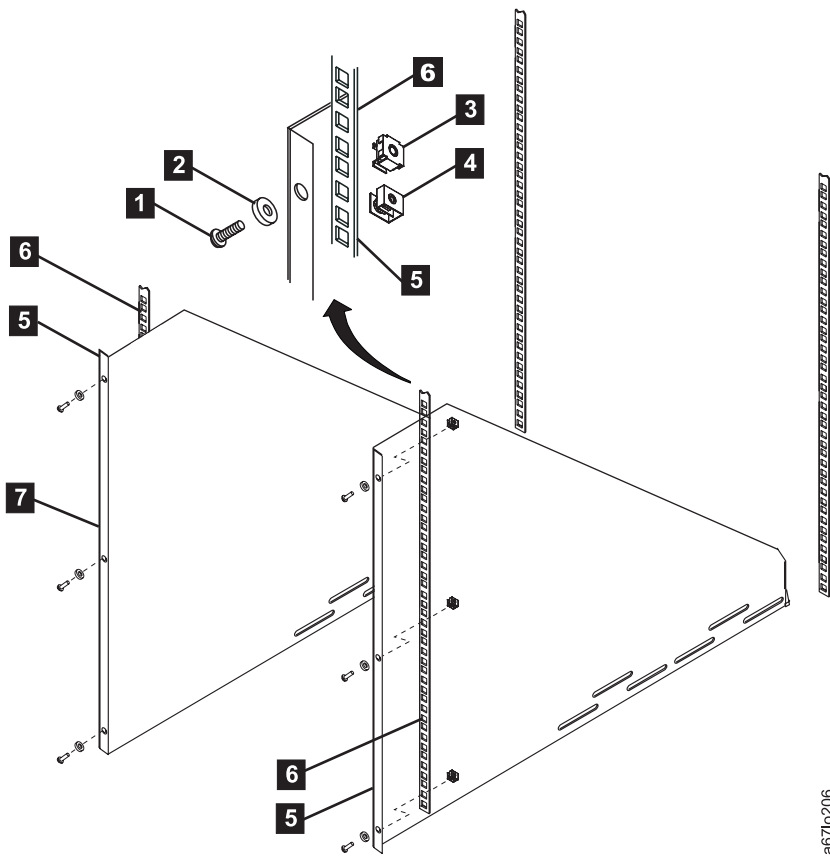
Figure 14-12. Example of standard racks

2. If you are installing the library into a rack that has a front door, remove the front door to simplify the subsequent steps.
3. If the rack has a stabilizing mechanism, such as wheel locks, ensure that they are locked and the rack is stable before proceeding.

- Place one of the front mounting brackets (see **7** in Figure 14-13) next to the rail **6**. Using the bracket as a template, install three cage nuts **3** (or clip nuts **4**) into the holes in the rail that are in line with the holes in the mounting bracket. Repeat this step for the second front mounting bracket.

Note: Figure 14-13 shows both clip nuts and cage nuts, but you must install only one type of nut.

- Perform one of the following:
 - For racks with square mounting holes, install cage nuts. Pinch the flanges of the nut together until it fits into the square on the vertical rail, then release the flanges.
 - For racks with round mounting holes, install clip nuts. Slide the clip nut onto the rail until it fits into the hole.
- Position the front mounting brackets **7** so that the flanges **5** are on the outside of the front vertical rails **6**.
- Secure the brackets to the rails with three Phillips screws **1** and three finishing washers **2**.



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Figure 14-13. Installing the front mounting brackets

8. Place one of the rear mounting brackets (see **7** in Figure 14-14) next to the rail **6**. Using the bracket as a template, install two cage nuts **3** (or clip nuts **4**) into the holes in the rail that are in line with the holes in the mounting bracket. Repeat this step for the second rear mounting bracket.
9. Position the rear mounting brackets **7** so that the flanges **5** are on the outside of the rear vertical rails **6**.
10. Secure the brackets loosely to the rails with two Phillips screws **1** and two finishing washers **2**.

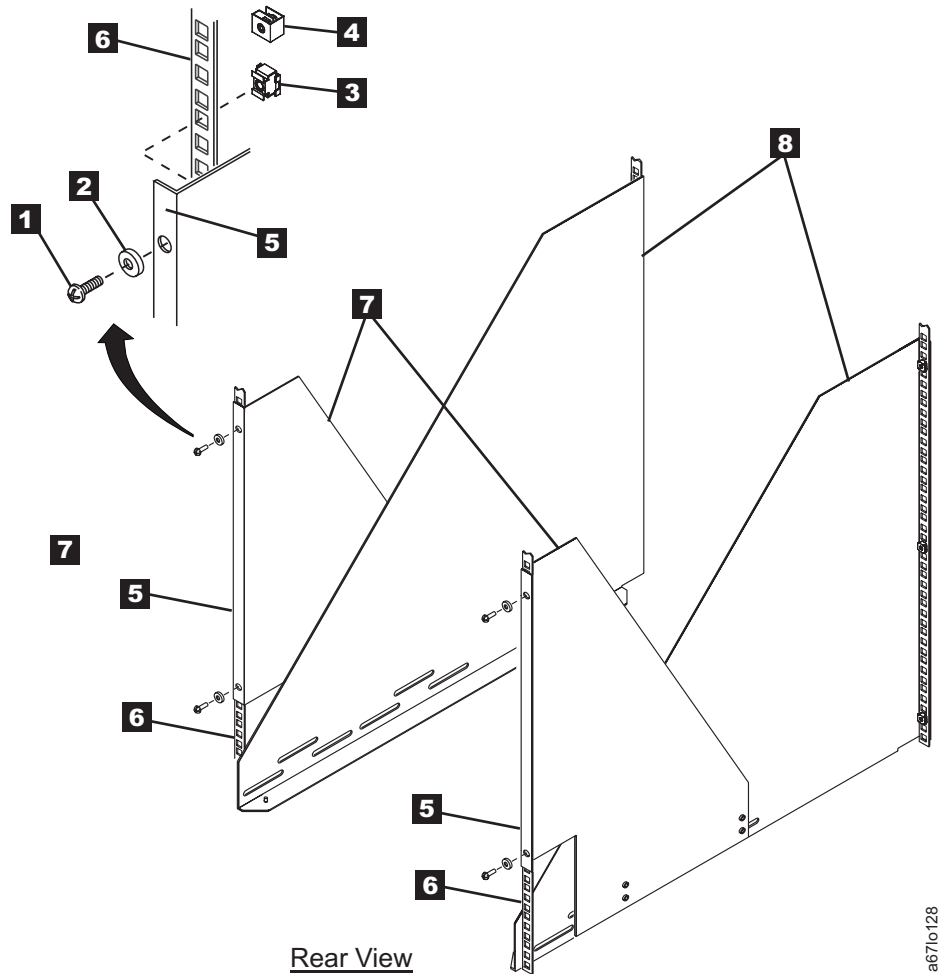


Figure 14-14. Installing the rear mounting brackets

11. Attach the front mounting brackets (see **2** in Figure 14-15) to the rear mounting brackets **1** by placing four screws **3** through the slots, two on each side. Secure the brackets loosely by tightening the screws.
12. Place the rear stop bracket **4** on the studs **5** located on the mounting brackets **2**. To have clearance for the rear stop bracket, you may need to push the front mounting brackets against the rear vertical rails. Secure the rear stop bracket by tightening the two nuts **6**.
13. Tighten all nuts and screws.

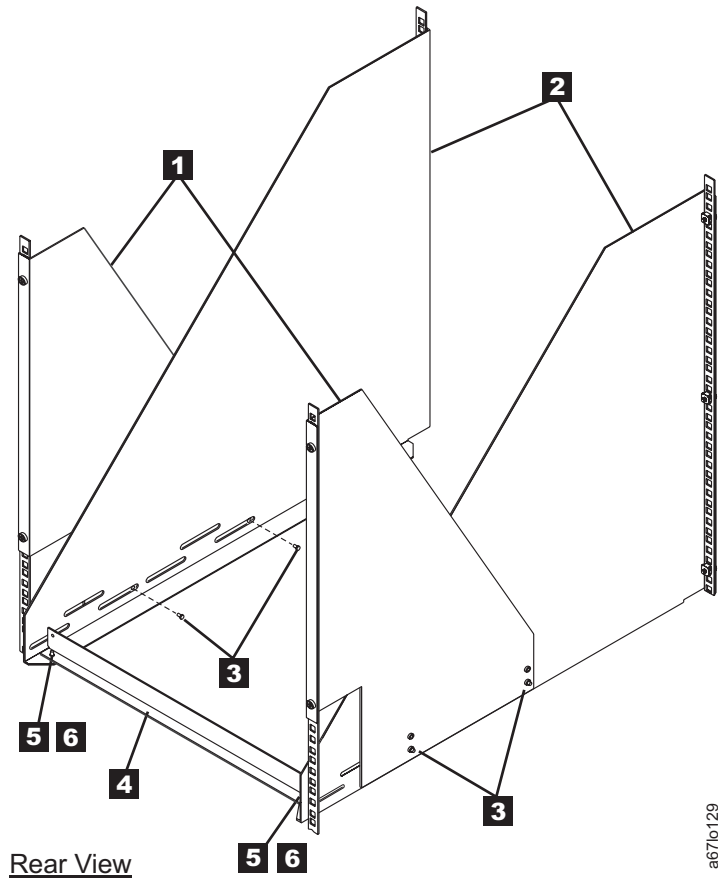


Figure 14-15. Installing the rear stop bracket

Remove Components to Reduce Library Weight

Required tools (not supplied): Phillips screwdriver and a 3/8-in. wrench

If drives are already installed in the library, go to step 3.

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



> 55 kg
(121.2 lb)



CAUTION:

The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes four people with a lifting device to safely lift this part or unit. (C011)

1. Remove all of the cartridges **1** and magazines **2** from the storage columns within the library (see Figure 14-16). To remove a magazine, grasp the tabs at its corners and pull the magazine toward you.
2. Close the front door securely.



Figure 14-16. Removing cartridges and magazines

3. To reduce its weight, remove all drive sleds and dc power supplies that are installed in the library. Note the position of the drive sleds as you remove them; you will need to replace them in the same positions. Loosen the captive thumbscrews **1** and slide the drive sled **2** and dc power supply **3** out of the chassis (see Figure 14-17 on page 14-22).

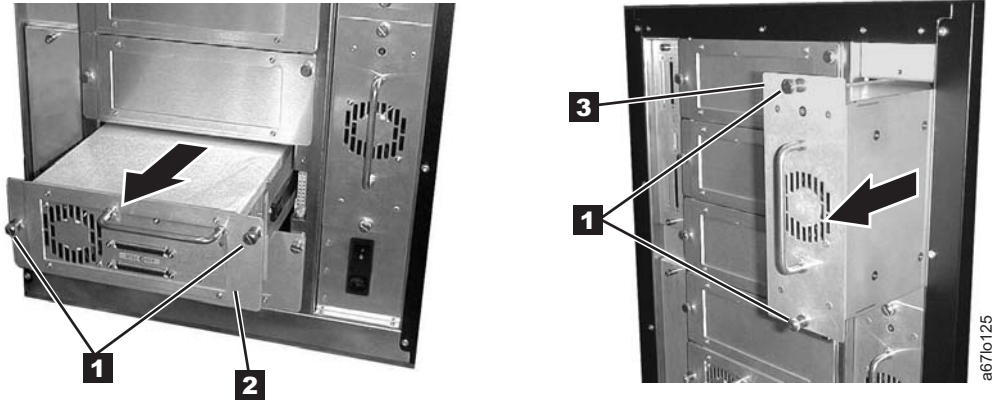


Figure 14-17. Removing the drive sleds and the DC power supplies. The figure shows an Ultrium 1 Tape Drive on the sled.

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

- Remove the four casters (**2** and **4** in Figure 14-18) from the bottom of the library. Use a 3/8-in. wrench to remove the bolts **1** that secure each caster to the frame (there can be up to four bolts).

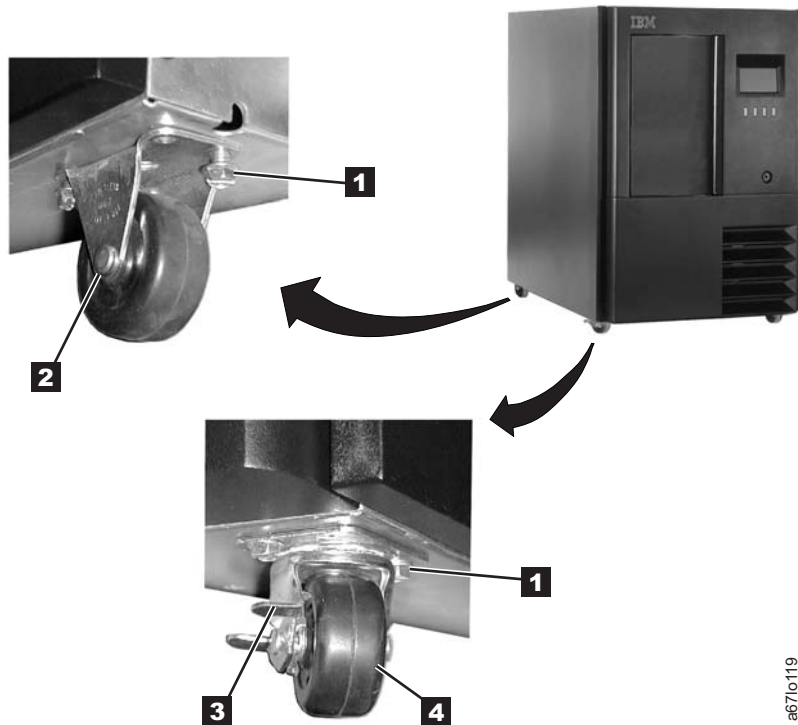


Figure 14-18. Removing the casters

- Return the library to its upright position.

Note: In the step that follows, open the front door (see **4** in Figure 14-19 on page 14-23) completely before removing the side covers.

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

Place the Library into the Rack

1. From the front of the rack, use the handles **3** located on both sides of the library to lift the library onto the rackmount hardware.

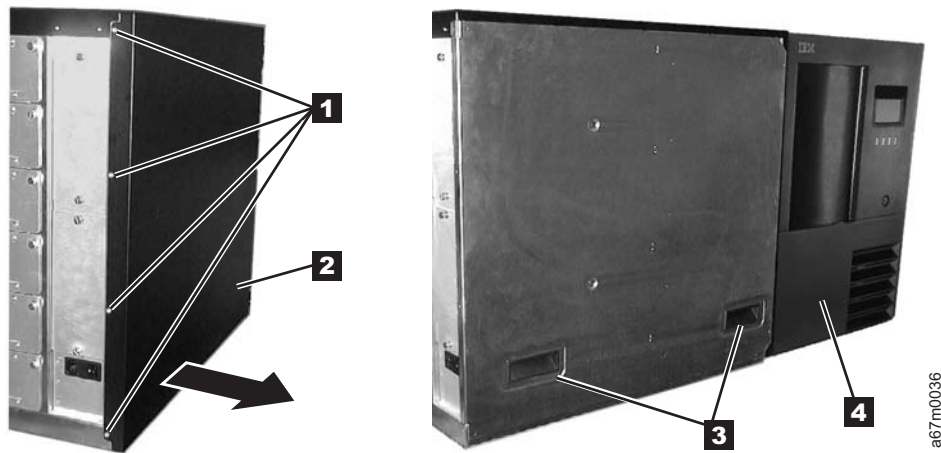


Figure 14-19. Removing the side covers

2. Slide the library (**1** in Figure 14-20) onto the rackmount hardware until it stops against the rear stop bracket **3**. Using the two Phillips screws **2**, attach the library to the rear stop bracket **3**. This ensures that the library is secured to the rack and is properly grounded.

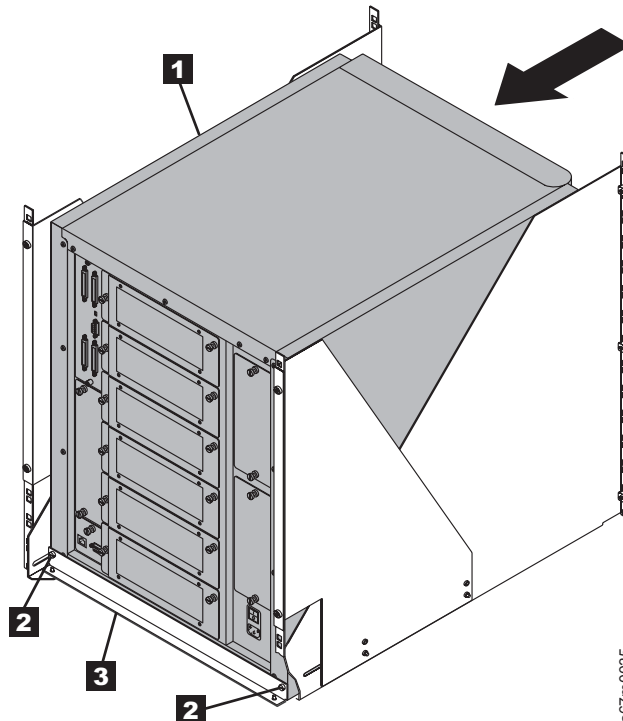


Figure 14-20. Placing the library into a rack (illustration shows converted library)

Replace Library Components

1. Use the following steps to install the drive sleds that you removed in step 3 on page 14-21.
 - a. From the rear of the library, locate the drive slot where you want to install a drive sled.
 - b. Slide the drive sled **2** into position and tighten the two captive thumbscrews **1** (see Figure 14-21).

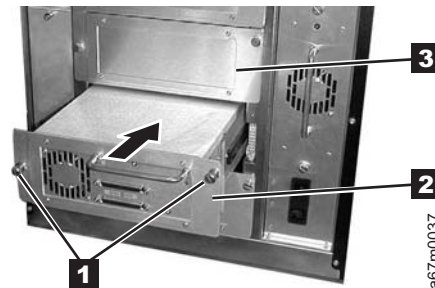


Figure 14-21. Installing a drive sled



Attention: Up to 240 V ac is present at the power supply connectors when the main power cord is connected to a power source.

2. Use the following steps to install the dc power supplies that you removed in step 3 on page 14-21.
 - a. From the rear of the library, locate the slot where you want to install the dc power supply.

Note: Before inserting the dc power supply, be sure to orient the power supply so that the light-emitting diode (LED) **3** is located as shown in Figure 14-22.

- b. Slide the dc power supply **1** into position until it mates with the power distribution board and tighten the two captive thumbscrews **2**.

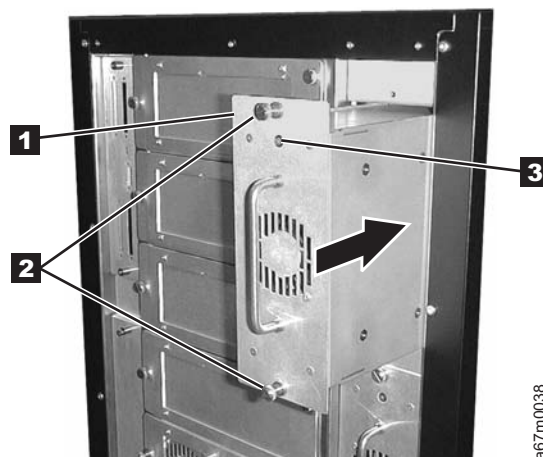


Figure 14-22. Proper orientation of the dc power supply

3. Reinstall the magazines and cartridges that you removed in step 1 on page 14-21.
4. If you intend to install one or more optional features, go to “Step 8. Install Optional Features” on page 14-25. Otherwise, go to “Step 10. Install Cables and Terminators” on page 14-34.

Step 8. Install Optional Features

If you are not installing an optional feature, go to “Step 9. Reposition Drives for Partitioning” on page 14-33.

If you ordered one or more optional features, install them now. Refer to Table 14-2 to find the correct procedure.

Note: Except for the Multi-Path feature, the customer is responsible for installing all optional features.

Table 14-2. Optional Features

To install...	Go to page...
Installing a drive sled	14-25
Redundant dc power supply (feature code 8008)	14-30 Must be installed by a trained IBM Service Representative
San Data Gateway Module	14-31
12-slot I/O station (feature code 8012)	14-29
18-slot tape storage column (feature code 8007)	14-26
6-cartridge magazine with cover (feature code 8013)	14-30

Installing a Drive Sled

When installing drive sleds for SCSI and Fibre Channel Tape Drives in the Ultrium Scalable Tape Library, you must insert the first sled in the bottom drive slot (slot 1). Add subsequent sleds directly above the last sled that is installed, from bottom to top (slots 2, 3, 4, 5, 6) with no empty slots (see Figure 14-23).

If you use partitioning, refer to the Setup and Operator Guide for guidelines.

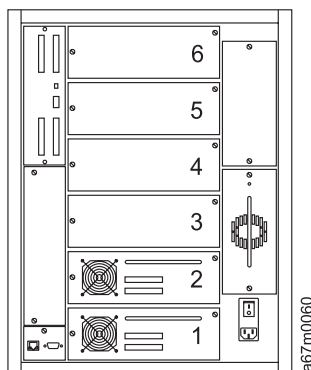


Figure 14-23. Correct order for installing drive sleds (illustration shows converted library)

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

Note: The Multi-Path Ultrium Scalable Tape Library consists of up to six SCSI devices: the six drives. The default settings for the SCSI IDs are 1 through 6 for the drives.

1. Use the server to set the library and the drives Offline for all attached servers.
2. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 14-26 on page 14-27).

3. From the rear of the library, locate the drive slot where you want to install the drive sled. Loosen the two captive thumbscrews on the filler plate and remove the filler plate (see **1** in Figure 14-24 or Figure 14-25). Save the filler plate for future drive maintenance activity.
4. Slide the tape drive sled **2** into position and tighten the two captive thumbscrews.

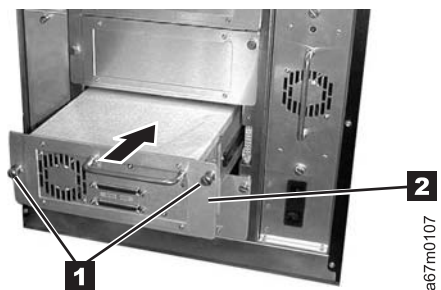


Figure 14-24. Installing a drive sled that contains an Ultrium 1 Tape Drive

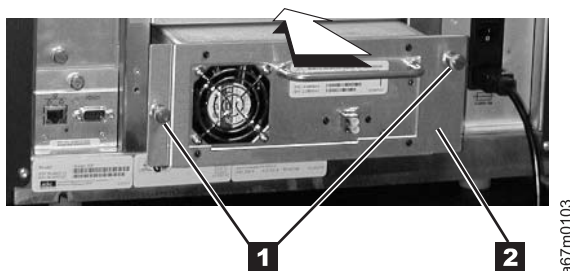


Figure 14-25. Installing a drive sled that contains an Ultrium 2 or Ultrium 3 Tape Drive

5. Install any additional optional features (see “Step 8. Install Optional Features” on page 14-25). Otherwise, go to “Step 9. Reposition Drives for Partitioning” on page 14-33.

Installing a Storage Column

Tools Required

- 10 mm or 3/8 in. nut driver or flat head screw driver
- T20 Torx driver
- Flashlight (optional)

Verify Shipment Contents

Check Off	Part Number	Description
	19P4527	Storage Column (FC 8007)
		Four 8-32 X 3/8 Torx 20 screws
		Four 1/4-20 X 1/2 hex bolts, slotted
	18P8886	Magazine Alignment Plates Kit (OPTIONAL FOR COLUMN 4 ONLY)
	19P1501	Installation Instructions

Preparing for Installation

For instructions on removing an existing storage column, refer to *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information* (SA37-0425). To install a storage column, complete the steps below.

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

__ Step 2. Power-off the library by pushing 0 on the power switch (see **1** in Figure 14-26).



Figure 14-26. Main power switch

__ Step 3. Open the library's front door.

__ Step 4. If necessary, gently move the picker assembly to a position in the Y-axis to allow access room.

Installing Magazine Alignment Plates Kit in Column 4 (Optional)

Note: Column magazine alignment plates are to be installed in Column 4 only!

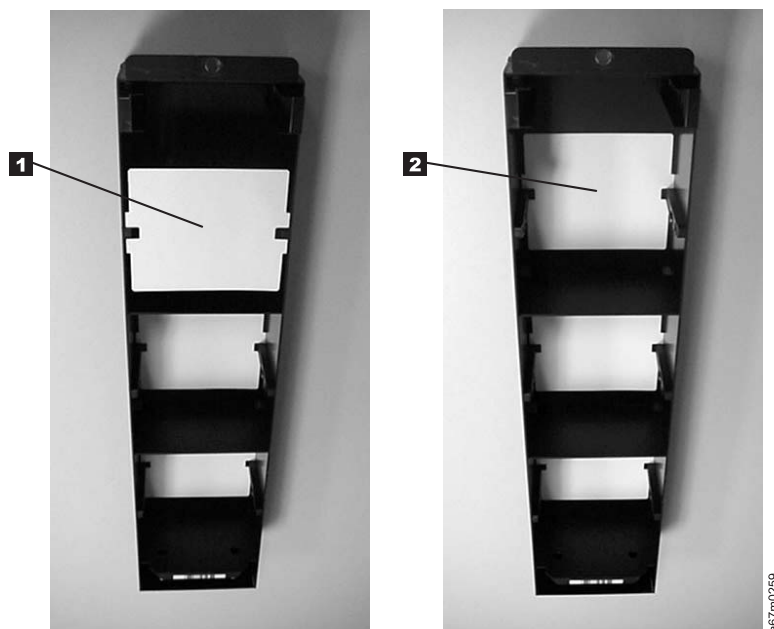


Figure 14-27. Optional Column Magazine Alignment Plates for Column 4 only

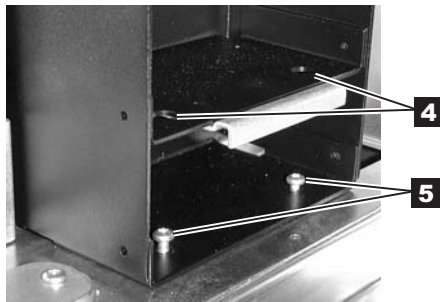
To install the Column Magazine Alignment Plates in Column 4:

- __ 1. Place the column on its back on a sturdy work surface and remove the magazines, if necessary.
- __ 2. Place a white alignment plate in each magazine slot in the column (**1**) and push each alignment plate firmly against the back wall of the column (**2**).

Installing Storage Columns



Top Attachment for all Storage Columns



Bottom Attachment for
Storage Columns 2 and 4



Bottom Attachment for
Storage Column 5

Figure 14-28. Installing a storage column

Note: Any parts removed during this installation and not specified for reinstallation are the property of the library owner.

Installing Storage Column 4:

- ___ 1. Insert the column inside the chassis along the right wall aligning the holes in the floor of the column with the holes in the floor of the chassis.
- ___ 2. Insert a T20 Torx driver through the access holes (**4** in Figure 14-28) in the bottom shelf of the column, and install two 8-32 X 3/8 Torx 20 screws (**5** in Figure 14-28) to attach the storage column to the floor of the chassis.
- ___ 3. Using a nut driver or flat head screw driver, install one 1/4-20 X 1/2 bolt (see **1** in Figure 14-28) to secure the top of the column to the chassis.
- ___ 4. Insert all magazines (see **2** in Figure 14-28) in the storage column.
- ___ 5. Proceed to "Installing Storage Column 5" or bring the library back online and resume normal operations.

Installing Storage Column 5:

1. Insert the column inside the chassis with the back of the column against the mounting bracket located in the front right corner of the floor of the chassis.
2. Using a nut driver or flat head screw driver, insert and tighten one 1/4-20 X 1/2 bolt (**3** in Figure 14-28) to attach the storage column to the mounting bracket located in the front right corner of the floor of the chassis.
3. Using the nut driver or flat head screw driver, install one 1/4-20 X 1/2 bolt (see **1** in Figure 14-28) to secure the top of the column to the chassis.
4. Insert all magazines (see **2** in Figure 14-28) in the storage column.
5. Bring the library back online and resume normal operations.

Installing a 12-Slot I/O Station

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

1. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 4-19 on page 4-11).
2. Open the library's front door.
3. If present, remove the cartridge from the single-slot I/O station.
4. Remove the four I/O station cable clamps (see **1** in Figure 14-29). Three of the cable clamps are attached to the door with a T20 Torx screw, and one is attached with a 11/32-in. nut.
5. Disconnect the I/O station cable connector **7** from the display assembly **2**.
6. Remove the eight 11/32-in. nuts **6** (four on each side) that secure the I/O station assembly to the front door.
7. Remove the single-slot I/O station.
8. The 12-slot I/O station is installed the same way as the single-slot I/O station. Perform the above steps in reverse order to install the 12-slot I/O station.
9. Insert two magazines **4** in the I/O station and one magazine **5** in the fixed location below the I/O station magazines.
10. Install any additional optional features (see step "Step 8. Install Optional Features" on page 14-25). Otherwise, go to "Step 9. Reposition Drives for Partitioning" on page 14-33.

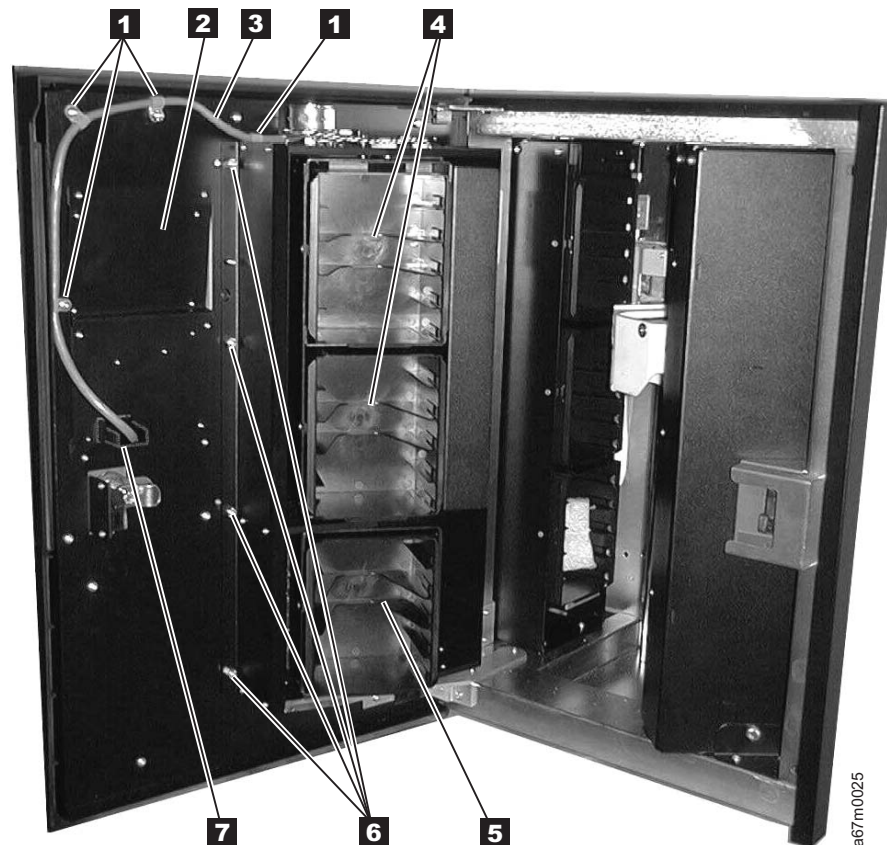


Figure 14-29. Installing the 12-slot I/O station

Installing a 6-Cartridge Magazine

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

Installing a Redundant dc Power Supply



Attention: Up to 240 V ac is present at the power supply connectors when the main power cord is connected to a power source.

1. Verify that the correct dc power supply is currently installed in the library by locating the dc power supply at the rear of the library (see **1** in Figure 14-30 and examining it for a label):
 - If the new power architecture (NPA) label **2** is present, the redundant dc power supply must also bear the NPA label.
 - If the NPA label is not present, the redundant dc power supply must not bear the NPA label.
 - If the labels on the dc power supplies do not match, do not continue with this installation. Contact your IBM Business Partner or IBM Marketing Representative to order the correct dc power supply.
 - If the labels on the dc power supplies match, go to step 2 to continue the installation.

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

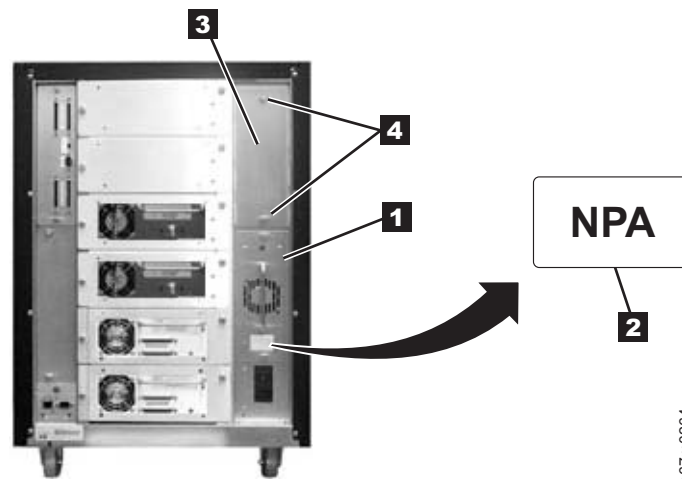


Figure 14-30. Installing a redundant dc power supply (illustration shows converted library)

2. Locate the slot **3** where the redundant dc power supply will be installed.
3. Loosen the two captive thumbscrews **4** on the cover plate and remove the cover plate (see Figure 14-31 on page 14-31).

Note: Before inserting the dc power supply, be sure to orient the power supply so that the LED **3** is located as shown in Figure 14-31 on page 14-31.

4. Slide the power supply (**1** in Figure 14-31 on page 14-31) into position until it mates with the power distribution board and tighten the two captive thumbscrews **2**.
5. Inspect the rear panel to ensure that all LEDs are green.

- If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green:
 - a. Power off the library.
 - b. Loosen the two thumbscrews on the power supply.
 - c. Pull the power supply part way out of the library.
 - d. Push the power supply back into the library.
 - e. Tighten the two thumbscrews on the power supply.
 - f. Power on the library.
 - If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green, contact your Service Representative.
6. Install any additional optional features (see step “Step 8. Install Optional Features” on page 14-25). Otherwise, go to “Step 9. Reposition Drives for Partitioning” on page 14-33.

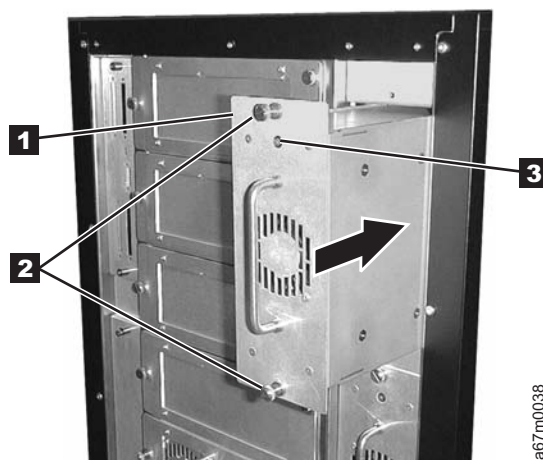


Figure 14-31. Installing a redundant dc power supply

Installing a San Data Gateway Module

- | **Note:** This feature is not supported with Ultrium 3 drives.

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

Verify Module Kit Inventory

- ___ 1. Four VHDCI-to-HD68 SCSI bus (signal) cables (0.6 m)
- ___ 2. Two 2-Gbit GBICs (installed in gateway)
- ___ 3. LVD terminator
- ___ 4. *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*
- ___ 5. Service accessory kit:
 - VHDCI-to-VHDCI SCSI wrap cable (0.5 m)
 - SC-to-SC Fibre Channel coupler block
 - Gateway service tools:
 - Null modem cable
 - Ethernet wrap tool
 - Fibre Channel wrap tool

Install the Module

1. From the rear of the Ultrium Scalable Tape Library, locate the dc power supply (see **3** in Figure 14-32) and examine it for a label:
 - a. If the NPA label **4** is present, proceed with the installation of the San Data Gateway Module.
 - b. If the NPA label **4** is not present, the library does not have the required power architecture to support the San Data Gateway Module. Do not continue with this procedure. Contact your IBM Business Partner or IBM Marketing Representative to order the necessary parts.
2. Use the server to set the library and drives Offline for all attached servers.
3. Power-off the Ultrium Scalable Tape Library by pushing O on the power switch (see **1** in Figure 4-19 on page 4-11).
4. From the rear of the library, locate the slot where you want to install the gateway (see Figure 14-32). Loosen the two captive thumbscrews on the cover plate and remove the cover plate.
5. Slide the gateway into position (see **1** in Figure 14-32) and tighten the two captive thumbscrews **2**.

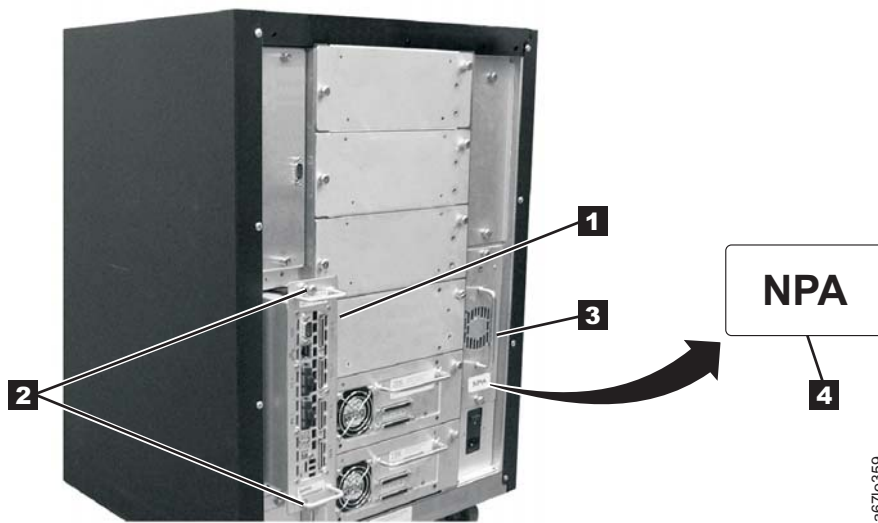


Figure 14-32. Installing a San Data Gateway Module

6. Install any additional optional features (see step “Step 8. Install Optional Features” on page 14-25). Otherwise, go to “Step 9. Reposition Drives for Partitioning” on page 14-33.

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

Step 9. Reposition Drives for Partitioning

Drives are preinstalled in the library at the factory for testing purposes before the library is shipped to the customer. It may be necessary to reposition the drives to partition the library.

Note: For more information on partitioning, refer to Installation Planning in the Setup and Operator Guide.

To reposition a drive, perform the following:

1. Power off the library.
2. Loosen the thumbscrews (**1**) on the drive sled (**2**).

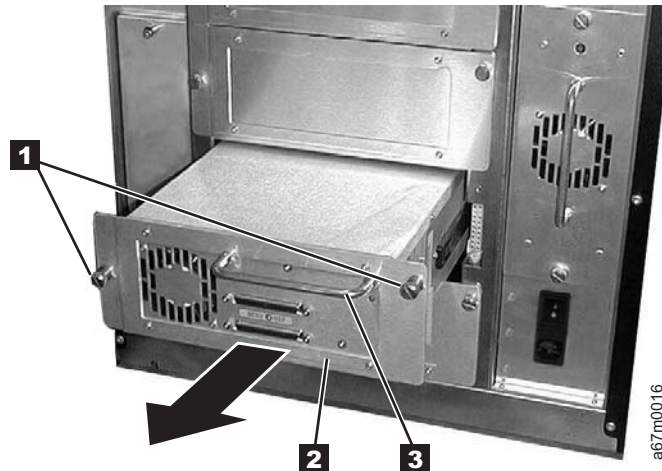


Figure 14-33. Repositioning a drive sled for partitioning

3. Pull the drive from the column using the handle (**3**). Support the bottom of the drive with your other hand.
4. Move the drive to its new location.
5. Tighten the thumbscrews (**1**).
6. Repeat this procedure for each drive that needs to be repositioned.

Step 10. Install Cables and Terminators

To install cables and terminators, choose one of the following procedures:

- “Making a Host-to-Drive Connection With Two Drives per SCSI Bus.”
- “Making Host-to-Drive Connections with Native Fibre” on page 14-37.
- “Making Host-to-Drive Connections with the San Data Gateway Module” on page 14-38.

Making a Host-to-Drive Connection With Two Drives per SCSI Bus

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

1. Attach the first host cable (**1** in Figure 14-34) to the lowest available drive in the logical library.
2. If attaching to the next device in a chain, connect the cable **2** to the other SCSI connector **3** on the drive.
3. Insert a SCSI terminator **4**. **Make sure that you use the terminator and not the wrap tool. They look very similar. You can tell the difference by their part numbers, which are stamped on each.**
4. Attach a second host cable **5** to one of the SCSI connectors on Drive 3 and terminate the remaining connector **6**.

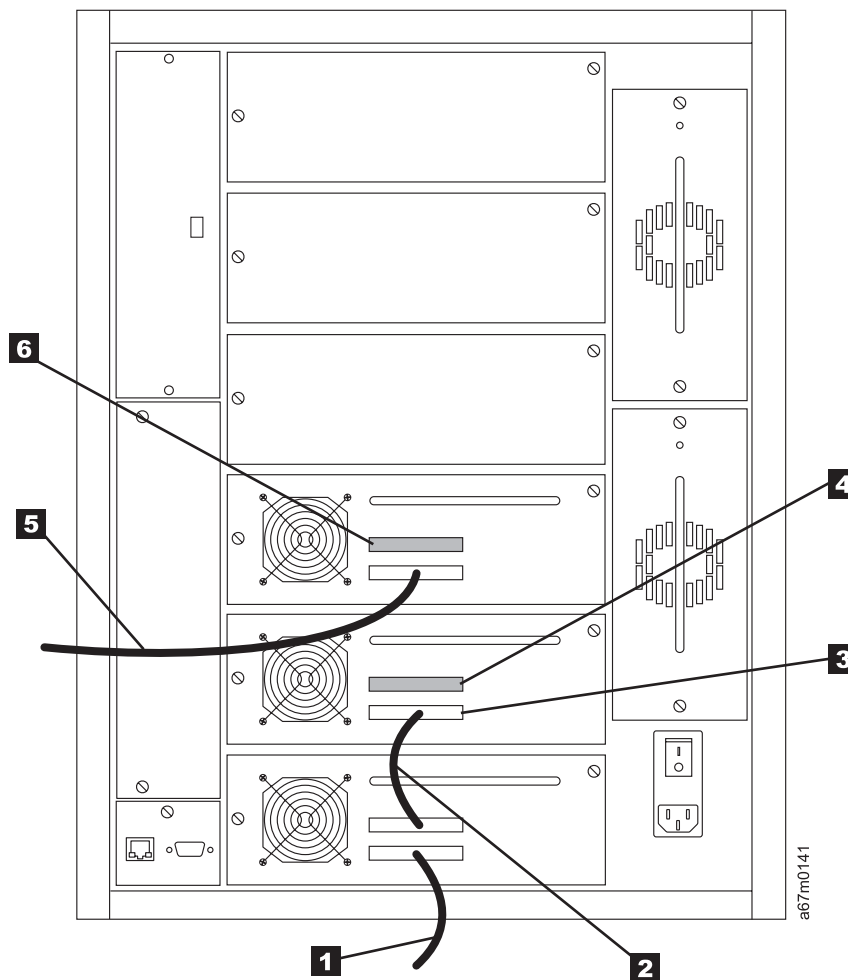


Figure 14-34. Making the host-to-drive connections with the SCSI Multi-Path feature and two hosts

Making a Host-to-Drive Connection With Three or more Drives per SCSI Bus

Note: For optimum performance, it is recommended to have a maximum of two drives per SCSI bus.

To make a host-to-drive connection with three or more drives per SCSI bus:

1. Attach the host cable (**1** in Figure 14-35 on page 14-36) to the lower SCSI connector in the lowest drive in the logical library.
2. To attach to the next device in a chain, connect the cable **2** to the upper SCSI connector in the lowest drive in the logical library and to the lower SCSI connector **3** on the next drive. Repeat this step for every drive in the SCSI bus.

EXCEPTION: If there are more than two drives in the library, either the drives should be split between SCSI buses so that there are no more than two drives per SCSI bus, or connect the drives so that no more than two consecutive drives are connected using the same cable length. Drives connected using cables less than 1 m **2** should be separated from other drives by cables greater than or equal to 1 m **5**.

Table 14-3. Correct position of longer cable with three or more drives per SCSI bus

No. of Drives in SCSI Bus	Longer Cable Connecting These Drives
3	2 and 3
4	2 and 3
5	2 and 3; 4 and 5
6	2 and 3; 4 and 5

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

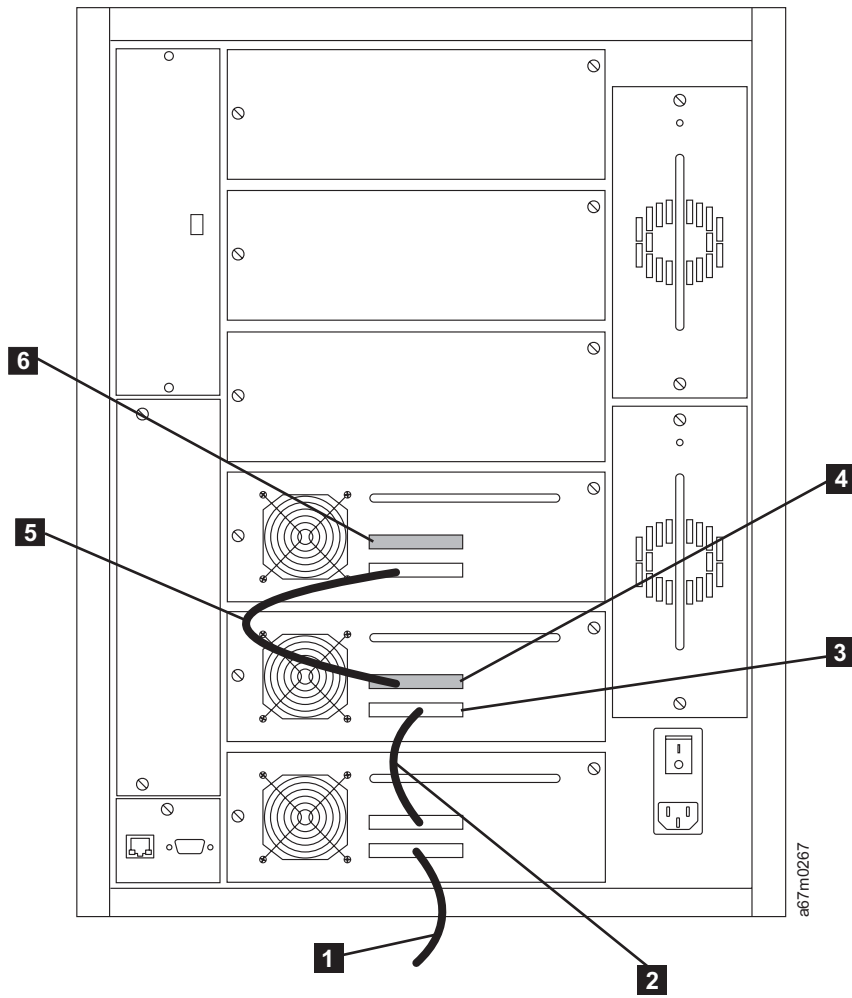


Figure 14-35. Making the host-to-drive connections with three or more drives per SCSI bus

Making Host-to-Drive Connections with Native Fibre

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

To connect to the host by using a native Fibre Channel connection, attach the host cables (**1** in Figure 14-36) to the LC connectors **2** of the Ultrium 2 Tape Drives that you want.

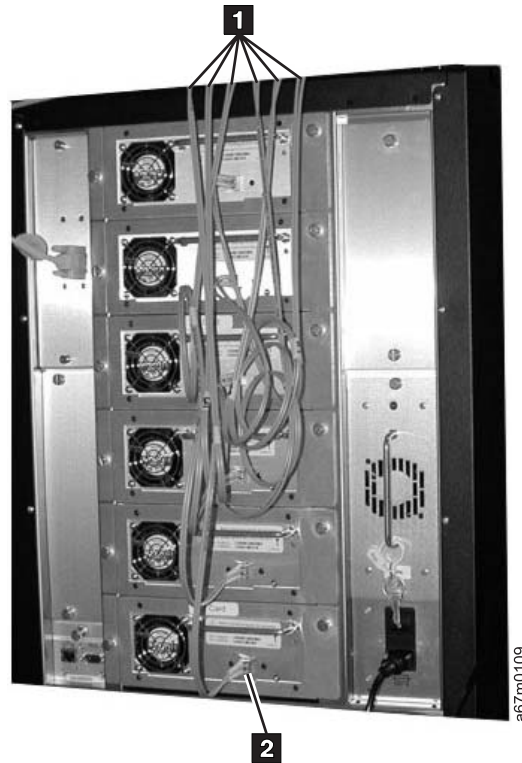


Figure 14-36. Making the host-to-drive connections with native Fibre Channel (Multi-Path library)

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

Notes:

1. This feature is not supported with Ultrium 3 drives.
2. IBM does not supply the fiber optic cable for this procedure. To order the appropriate fiber cable, contact your IBM Business Partner or IBM Marketing Representative

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

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

Figure 14-37 shows examples of the Fibre Channel and SCSI connectors.

- | | | | |
|----------|-----------------------------------|----------|----------------------|
| 1 | LC Fibre Channel connector | 4 | HD68 SCSI connector |
| 2 | SC Fibre Channel connector | 5 | VHDCI SCSI connector |
| 3 | SC-to-LC Fibre Channel interposer | | |

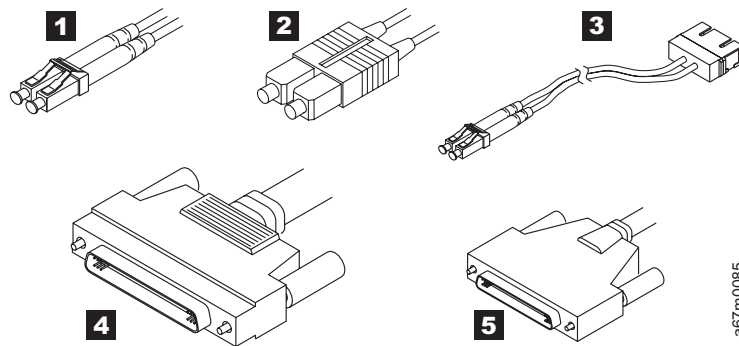


Figure 14-37. Cable connectors

Connecting the Fiber Cable from the Host to the Library

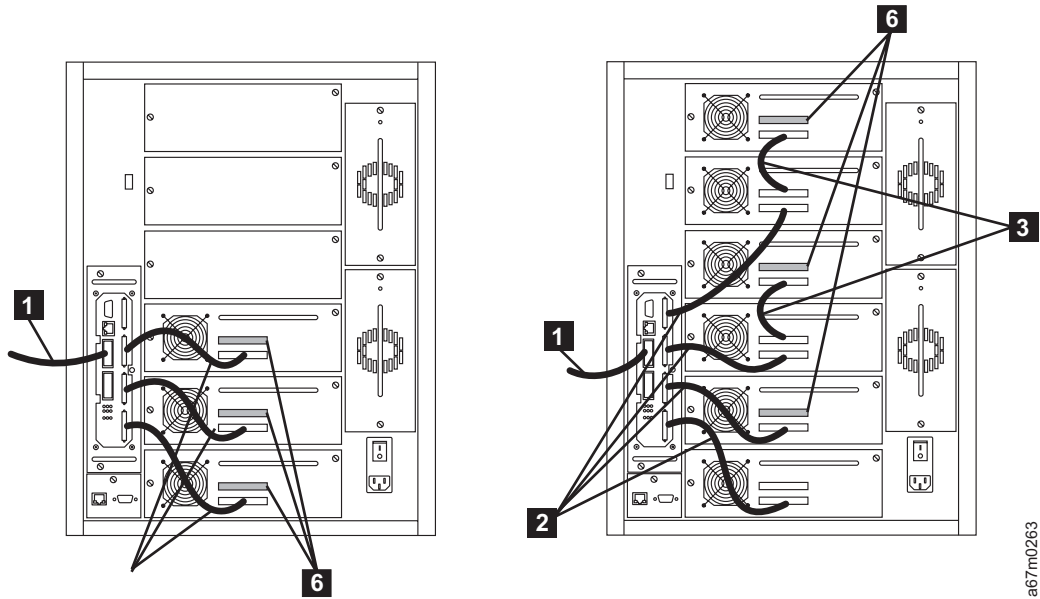
Attach the fiber cable from the host (server) to the GBIC of one of the Fibre Channel connectors on the gateway (**1** in Figure 14-38 on page 14-39).

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

Connecting the SCSI Cables from the Library to the Drives

Because the SCSI ports on the gateway are LVD, use only the LVD connections on the library' SCSI host interface board and LVD drives. Figure 14-38 on page 14-39 shows examples of SCSI cable connections with three drives and six drives installed. The host cable is shown as **1**.

Note: The cabling configuration may affect performance.



at67m0263

Figure 14-38. Example of cabling with three or six drives installed (Multi-Path library). The library with three drives is on the left; the library with six drives is on the right.

1. Attach the SCSI cables **2** from the drives to the SCSI ports of the gateway. (Four 0.6-m VHDCI-to-HD68 SCSI cables are provided with each library. If your library is installed with more than four drives, daisy-chain the drives by using HD68-to-HD68 cables **3**.)
2. Install a terminator **6** on the last SCSI device on each SCSI bus. Each of the four gateway SCSI ports is a separate SCSI bus. Each one must be terminated at the last device on the bus.

Note: Ensure that you are using an LVD terminator. Also, IBM provides a terminator for each drive and the library.

3. Go to “Step 11. Turn on Power” on page 14-40 to continue the installation of the library.

Step 11. Turn on Power



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

1. Push I on the power switch to turn on the power. The library takes a few minutes to perform initialization.
- I 2. Inspect the rear panel to ensure that all drive LEDs are green.
 - If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green:
 - a. Power off the library.
 - b. Loosen the two thumbscrews on a drive.
 - c. Pull the drive part way out of the library.
 - d. Push the drive back into the library.
 - e. Tighten the two thumbscrews on the drive.
 - f. Power on the library.
 - If all LEDs are green, proceed with the installation.
 - If any LEDs are **not** green, contact your Service Representative.
3. The library firmware automatically initializes and starts the inventory/teach process. After initialization is complete, proceed to the next section for information on partitioning the library.

Step 12. Partition the Library

To partition the library, perform the following steps.



**Shortcut: Main Menu (initial screen) → More → Setup → Library
→ Partitions**

Note: Most functions can be performed with the library Online or Offline. If a function requires the library to be Offline, the function will first provide a selection to go Offline.

The Partitions Dialog displays the number of logical libraries that are currently partitioned (see Figure 14-39).

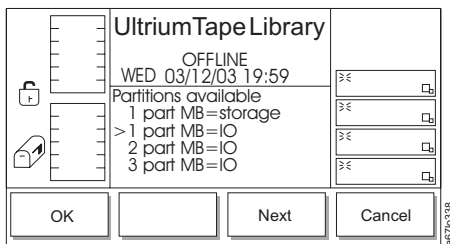


Figure 14-39. Partitions Dialog

The Partition Dialog contains the following information:

- part** The quantity of logical libraries in the library. Valid values are from 1 to 3.
- MB** Indicates that the I/O station is configured as storage or as an I/O station. Valid values are storage and I/O.

Perform one of the following:

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

Step 13. Set SCSI and FC IDs

Setting the SCSI IDs

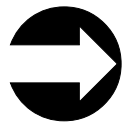
The Multi-Path Ultrium Scalable Tape Library consists of up to six SCSI or fiber devices. The **default settings** for the SCSI IDs are 1 through 6 for the drives. Depending on your requirements, you may need to change the SCSI ID default settings for your installation.

Notes:

1. Do not select an ID that is already in use on the same SCSI bus.
2. Do not select the SCSI ID of the SCSI host adapter card. On the SCSI bus, any initiator (such as a host adapter card) that needs to communicate with the library must have its SCSI ID set from 0 to 15. The SCSI ID of the SCSI host adapter card is usually higher than any device on the SCSI bus. Generally, the SCSI ID for the host adapter is 7.
3. Use similar precautions for setting fibre loop IDs.

Setting the SCSI IDs of the Drives

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



Shortcut: Main Menu (initial screen) → More → Setup → Drives → SCSI/FC

1. The current drive is the value in the Drive: field. The existing drive's SCSI ID is the value in the SCSI ID: CURRENT field.

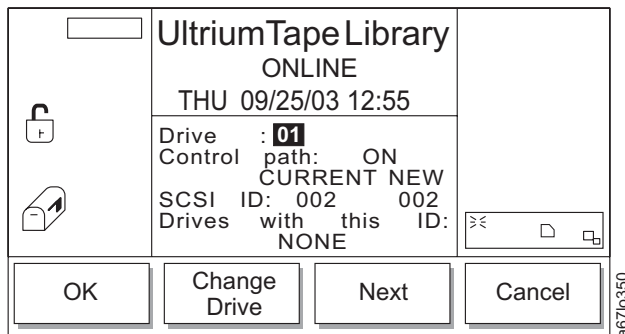


Figure 14-40. Drive SCSI Dialog

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

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

1. Press the button below the **Next** softkey. The Drive SCSI ID Dialog displays (see Figure 14-41 on page 14-43).

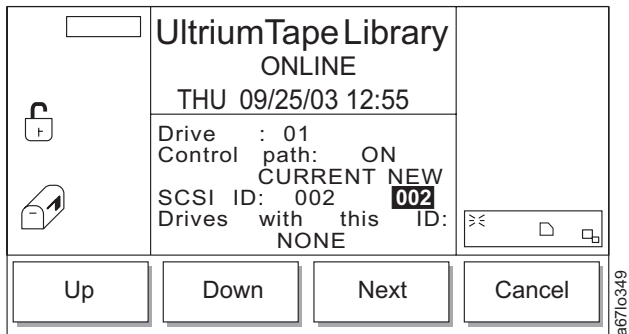


Figure 14-41. Drive SCSI ID Dialog

2. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the SCSI ID: NEW field.
3. Press the button below the **Next** softkey until the **OK** softkey displays.
4. Press the button below the **OK** softkey to accept the new ID.
5. To activate the new SCSI ID, cycle power to the library (turn it off, then on again).

Setting the FC IDs

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



Shortcut: Main Menu (initial screen) → More → Setup → Drives → SCSI/FC

Note: Even though the library may contain fibre channel drives, the softkey on the operator panel will show "SCSI". However, the drives will be correctly identified as SCSI or fiber in subsequent screens.

1. The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the Drive: field. Acceptable values are 000 to 127. The value of its FC ID displays in the FC ID: CURRENT field.

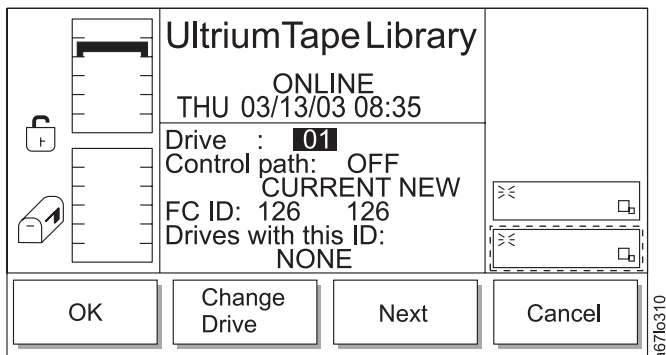


Figure 14-42. FC Submenu

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

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

1. Press the button below the **Next** softkey. The Loop ID Dialog displays (see Figure 14-43).

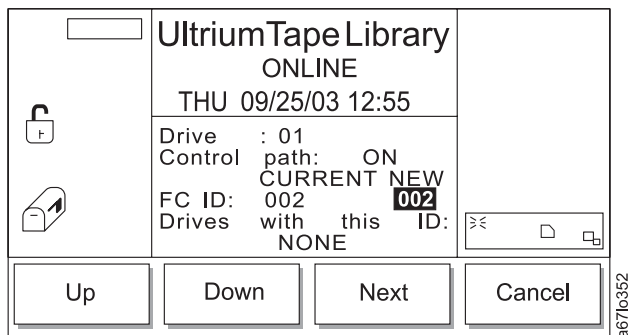


Figure 14-43. Loop ID Dialog

2. Press the button below the **Up** or **Down** softkey until the ID that you want displays in the FC ID: NEW field.
3. Press the button below the **Next** softkey until the **OK** softkey displays.

Step 14. Add Control Paths

The maximum allowable control paths for a library is equal to the quantity of drives assigned to that library.

Enter the Control Path Failover License Key

The Ultrium Scalable Tape Library requires that you use an 8-character license key to enable the control path failover feature. To enter a license key, perform the following steps.

Note: The Control Path Failover License Key must be purchased separately. Contact your IBM Sales Representative and order Feature Code 1680.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → More → License

The License Dialog displays (see Figure 14-44).

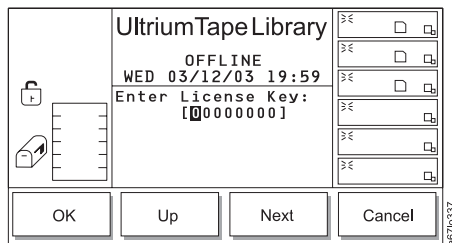


Figure 14-44. License Dialog

- Perform one of the following:
 - To accept all characters in the license key, press the button below the **OK** softkey.
 - To select another character, press the button below the **Next** softkey until the character that you want is highlighted. To increment that character, press the button below the **Up** softkey until 0 through 9 or A through F displays.
- Press the button below the **OK** softkey, then press the button below the **Drives** softkey. Continue to the next section to add control paths.

Add Control Paths

1. Press the button below the **SCSI/FC** softkey. Depending on the type of drive, the SCSI or FC Submenudisplays (see Figure 14-45 on page 14-46). The submenu gives the settings for the selected Fibre Channel drive. The value of the current drive displays in the Drive: field. The Control path field indicates whether the drive is a control path. Valid values are OFF or ON.

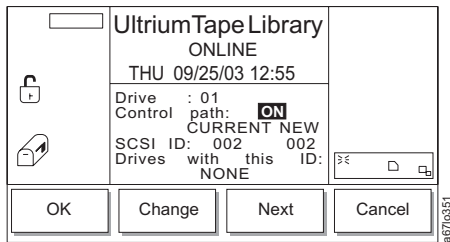


Figure 14-45. SCSI Submenu

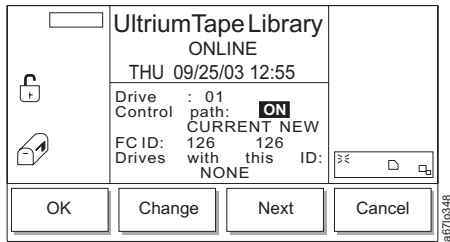


Figure 14-46. Loop Submenu

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

Step 15. Install Additional Options

The following optional installations can be completed at this time.

- “Configure the San Data Gateway Module (optional)”
- “Configure Other Options using Config Dialog”
- “Enable Operator Panel Security” on page 14-49

Configure the San Data Gateway Module (optional)

| **Note:** This feature is not supported with Ultrium 3 drives.

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

Configure Other Options using Config Dialog

Using the Config Dialog on the operator panel, the following options can be configured:

- Operator panel backlighting
- Operator panel audio
- Cartridge scan on initialization
- Cartridge touch on initialization
- I/O station used as storage



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Config

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.

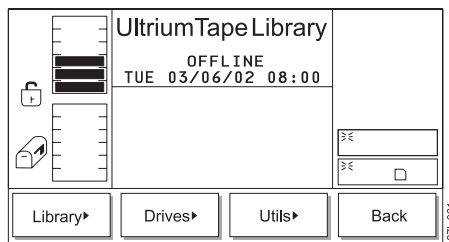


Figure 14-47. Setup Menu

2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 14-48).

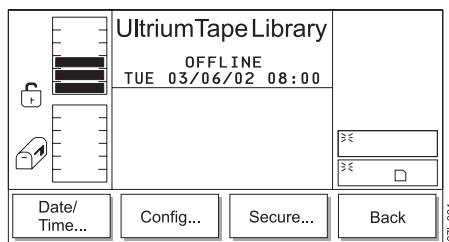


Figure 14-48. Utils Submenu

3. Press the button below the **Config** softkey. The Config Dialog displays (see Figure 14-49) with the following information:

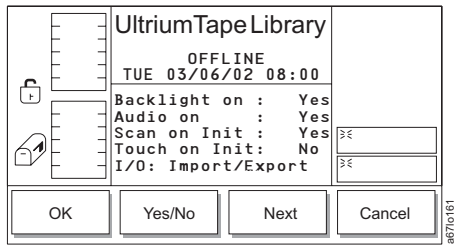


Figure 14-49. Config Dialog

Field	Value	Description
Backlight on	Yes	Turns on the backlighting
	No	Turns off the backlighting
Audio on	Yes	Enables audio output
	No	Disables audio output
Scan on Init	Yes	The picker will scan for all cartridges upon library initialization.
	No	The library will not scan for all cartridges upon library initialization.
Touch on Init	Yes	Unlabeled tape inventory support
	No	No unlabeled tape inventory support
Mailbox (I/O Station)	Imprt/Exprt	The I/O station is configured as a cartridge import/export location. Recommended setting
	Storage	The I/O station is configured as cartridge storage.

Attention:

It is recommended that the library be configured to Scan on Init unless your library has no bar code labels. In that case, Touch on Init should be also be enabled.

4. Press the button beneath the desired softkey.

- If the button beneath the **OK** softkey is pressed, the current field values are accepted, and the Utils Submenu is displayed (see Figure 14-48 on page 14-47).
- If the button beneath the **Yes/No** softkey is pressed, the selected field is changed to one of the associated field values listed above.
- If the button beneath the **Next** softkey is pressed, the next field in the list is made active. If the next field is the last field, the Config I/O Station Dialog is displayed (see Figure 14-50).
- If the button beneath the **Cancel** softkey is pressed, the Utils Submenu is displayed (see Figure 14-48 on page 14-47).

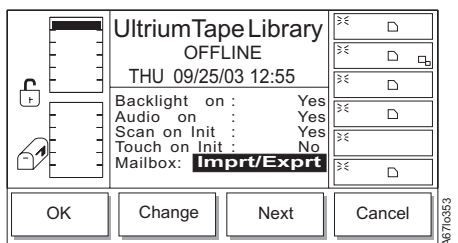


Figure 14-50. Config I/O Station Dialog

5. In the Config I/O Station Dialog, press the button beneath the desired softkey.
 - If the button beneath the **OK** softkey is pressed, the current field values are accepted and the Utils Submenu is displayed (see Figure 14-48 on page 14-47).
 - If the button beneath the **Change** softkey is pressed, the Mailbox (I/O station) field value is changed to Import/Export or Storage.
 - If the button beneath the **Next** softkey is pressed, the Config Dialog is displayed (Figure 14-49 on page 14-48).
 - If the button beneath the **Cancel** softkey is pressed, the Utils Submenu is displayed (see Figure 14-48 on page 14-47).

Note: If you configure the I/O station as storage slots, you must cycle power to the library (turn it off, then on) to make the change take effect.

Enable Operator Panel Security

The Enable Security feature allows you to protect your data. The default setting is Disable Security, but you can enable security by using the following procedure.

Note: When security is enabled, the library will prompt you for your password each time that you attempt to access certain protected procedures.

To enable security on the library, perform the following steps.



Shortcut: Main Menu (initial screen) → More → Setup → Utils → Secure

1. Navigate to the Setup Menu. For instructions, see “Accessing the Setup Menu” on page 4-8.

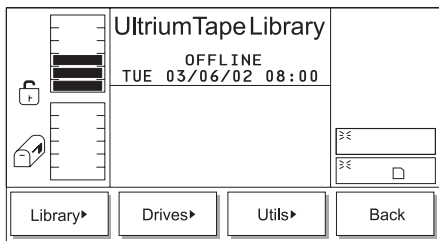


Figure 14-51. Setup Menu

2. Press the button below the **Utils** softkey. The Utils Dialog displays (see Figure 14-52).

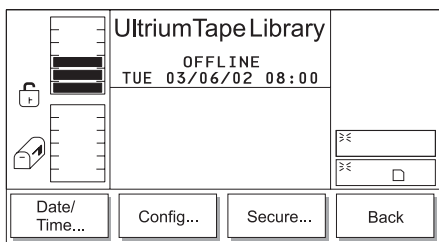


Figure 14-52. Utils Submenu

- Press the button below the **Secure** softkey. The Secure Dialog displays (see Figure 14-53).

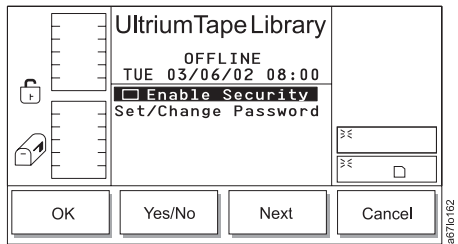


Figure 14-53. Secure Dialog

- Press the button below the **Yes/No** softkey until a checkmark displays in the checkbox beside the Enable Security field. The library displays the message **Security is now ON.**
- Press the button below the **OK** softkey to redisplay the Secure Dialog and view the new setting.
- Press the button below the **OK** softkey and return to the Utils Submenu.

Change Your Password

After you have enabled operator panel security, change the password. The initial login password is **0000**. When changing your password, record the new password on the Library Configuration Form and place the form in a secure location.

Note: The RMU password is different from the operator panel password. To change your RMU password, see “Configuration” on page 3-11.

To change the operator panel password, follow these steps:

- Press the button below the **Secure** softkey. The Enter Password Dialog displays (see Figure 14-54).

Note: If security is enabled, you must enter the existing or default password (**0000**) to display the Secure Dialog (see Figure 14-55 on page 14-51).

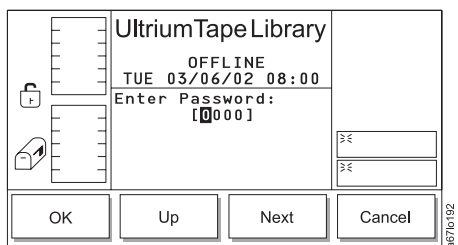


Figure 14-54. Enter Password Dialog

- Enter your existing password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the New field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value.
- Press the button below the **OK** softkey. The Secure Dialog screen displays (see Figure 14-55 on page 14-51).

Note: In Figure 14-55 on page 14-51, the absence of a checkmark in the checkbox beside the Enable Security field indicates that security has not been enabled.

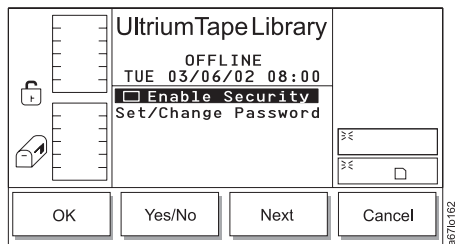


Figure 14-55. Secure Dialog

4. Press the button below the **Next** softkey to highlight the Set/Change Password field.
5. Press the button below the **Change** softkey. The Set/Change Password Dialog displays (see Figure 14-56).

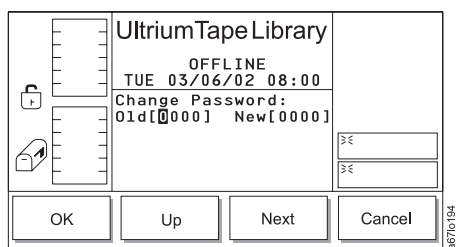


Figure 14-56. Set/Change Password Dialog

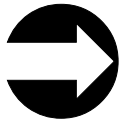
6. Enter the old password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the Old field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the old password, then press the button below the **OK** softkey to go to the New field.
7. Enter the new password by pressing the button below the **Next** softkey until the selection cursor highlights the first character in the New field. Press the button below the **Up** or **Down** softkeys to increase or decrease the numeric value. Repeat for each character in the new password.
8. Verify that the passwords are correct on the display, then press the button below the **OK** softkey to effect the change. The library displays the message **The password has been changed.**
9. To return to the Secure Dialog, press the button below the **OK** softkey. To return to the Main Menu, press the button below the **OK** softkey.
10. To continue to return to the Main Menu, press the button below the **Back** softkey until the Main Menu displays.

Note: When changing your password, record the new password on the Library Configuration Form.

Step 16. Import Cleaning Cartridge(s)

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

Before you import a cleaning cartridge, make sure that autoclean is enabled (see “Enabling and Disabling Automatic Cleaning” on page 4-49).



Shortcut: Main Menu (initial screen) → Command → I/O Station → AutoClean → Import

1. Navigate to the Command Menu. For instructions, see “Accessing the Command Menu” on page 4-7.

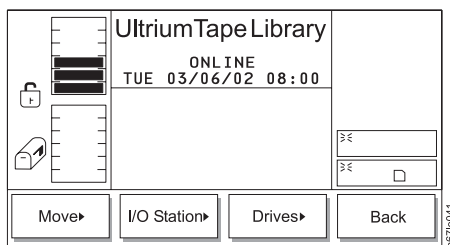


Figure 14-57. Command Menu

2. Press the button below the **I/O Station** softkey. The I/O Station Submenu displays (see Figure 14-58).

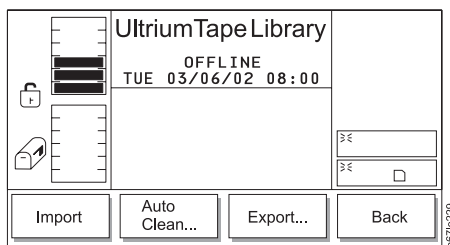


Figure 14-58. I/O Station Submenu

3. Press the button below the **AutoClean** softkey. The AutoClean Dialog displays (see Figure 14-59) with the following information about cleaning cartridges and cleaning slots in the library.

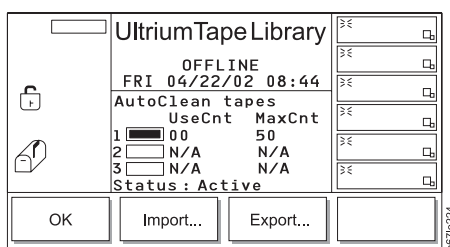





Figure 14-59. AutoClean Dialog

<p>á</p> <p>1 </p> <p>2 </p> <p>3 </p>	<p>Represents the quantity of storage slots that are designated for a cleaning cartridge. A cleaning slot is located at the top of columns 2, 4, and 5. In the AutoClean Dialog, slot 1 refers to the slot in column 2, slot 2 refers to the slot in column 4, and slot 3 refers to the slot in column 5. A shaded box means that the slot is occupied; a box that contains no shading means that the slot is empty.</p>
UseCnt	<p>The number of times that the cleaning cartridge has been used to clean a drive. Valid values are 0 through 99, or EXP for an expired cartridge.</p> <p>Note: This count is maintained by the drive firmware and stored in a cartridge memory save area on the cleaning cartridges.</p>
MaxCnt	<p>The number of times that the cleaning cartridge can be used to clean a drive. Valid values are 50 (the maximum) or EXP for an expired cartridge. Values in the MaxCnt column are read only.</p>
Status	<p>Indicates whether the AutoClean function is currently enabled (Active) or disabled (Inactive).</p>

4. If no cleaning cartridge is present in the library (each of the three rectangular boxes contain no shading), import a cleaning cartridge by pressing the button below the **Import** softkey. The Cleaning Tape screen displays (see Figure 14-60).

Note: The Import softkey is only available if there are empty cleaning cartridge storage slots; the Export soft key is only available if there is at least one cleaning cartridge.

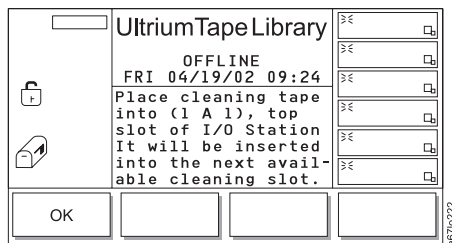


Figure 14-60. Cleaning Tape screen

5. Open the door of the I/O station and place a cleaning cartridge into the top slot of the I/O station. Use only the top slot of the I/O station.
6. Close the door of the I/O station. The library executes the TEACH and INVENTORY procedures.
7. Perform one of the following:
 - To return to the AutoClean Dialog, press the button below the **OK** softkey.
 - To return to the Main Menu press the button below the **OK** softkey twice, then press the button below the **Back** softkey until the Main Menu displays.

Step 17. Populate the Library with Data Cartridges

Attention: Do not use this method to insert a cleaning cartridge into the library. To insert a cleaning cartridge, see “Step 16. Import Cleaning Cartridge(s)” on page 14-52.

To directly insert media, perform the following procedure:

1. Use the operator panel to place the library into the Offline state (**Main Menu > Online/Offline > OK**).
The picker completes any current task.
2. Unlock and open the library door.
3. Place the cartridges into the desired storage slots.
4. Close and lock the door.

The library executes the TEACH and INVENTORY procedures.

Step 18. Configure the RMU

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

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

To configure the RMU for use, perform the following steps:

1. Press the following push buttons: **Main Menu (initial screen) Setup > Library > RMU**. The RMU dialog displays (see Figure 14-61).

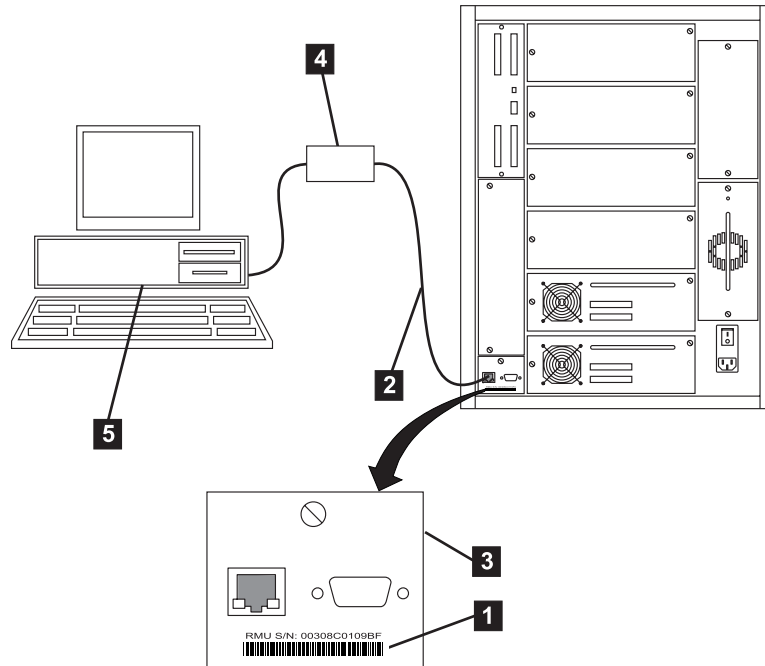
UltriumTape Library			
ONLINE			
TUE 03/06/02 08:00			
IP : 192.168.080.239	><		
Sub : 255.255.255.000	><		
Gate: 192.168.080.001	><		
Name: XXXXXX	><		
Up	Down	Next	Cancel

Figure 14-61. RMU Dialog

- Note:** If the RMU dialog does not display and the operator panel displays the message Could not establish communication with the RMU board a problem exists with the RMU connection. Disconnect the RMU from the library by loosening its thumbscrews and pulling it out approximately 7 cm (3 in.). Wait 5 seconds, then reconnect the RMU (you do not have to power-off the library). Return to step 1 and restart the procedure.
2. Use the push buttons below the **Up** or **Down** softkeys to enter the IP address, subnet address, gateway, and name, similar to the example values shown in Figure 14-61. Press the button below the **Next** softkey to accept the current field and advance to the next field.
 3. After you have set the value for each field, press the button below the **OK** softkey to accept the settings and return to the Library menu.
 4. Attach an Ethernet cable (**2** in Figure 14-62 on page 14-56) with RJ-45 connectors to the RMU **3** and an Ethernet hub **4** that is attached to a computer **5**.

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

When you configure the Ultrium Scalable Tape Library to a network the media access control address (MAC ID) that appears on the RMU (see **1** in Figure 14-62 on page 14-56) must match the MAC Address that displays on the Library Status screen of the TotalStorage Specialist (see Figure 14-63 on page 14-56). The MAC ID is the RMU's serial number. It appears on the RMU as RMU S/N: xxxxxxxxxx (where xxxxxxxxxx equals the serial number); the same number must appear on the Library Status screen of the TotalStorage Specialist, although colons typically separate the characters.



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Figure 14-62. Connecting the RMU to a computer (illustration shows converted library)

- On the terminal of your server, use a web browser to type the IP address or the hostname of the RMU. The TotalStorage Specialist Status page displays (see Figure 14-63).

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TotalStorage™

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Ultrium Tape Library Specialist

Name: RASRMU (IBM ULT3583-TL)

Status
Configuration
Firmware
Diagnostics file
Operator panel
Logs

IBM ULT3583-TL



Library Status	Offline Click here for details
Drive Status	LTO: 4 drives
RMU User	No current user
Hostname	RASRMU
IP Address	192.1.1.101
MAC Address	00:30:8C:01:03:48
Library Serial #	0000078113151000
SNMP	Off
SNMP Alerts	Off
Library Firmware	6.01
RMU Firmware	190B.00003

a67lc177

Figure 14-63. Status page

- Select the Configuration tab. The Login page displays (see Figure 14-64 on page 14-57).

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Figure 14-64. Login page

7. Enter the login name and password (the initial login name is admin and the initial password is secure), then click on Submit. The Configuration page displays (see Figure 14-65 on page 14-58). You can now add new users and change the password.

Remote Management Unit - Microsoft Internet Explorer

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Back Forward Stop Refresh Home Search Favorites Media

Address http://192.1.1.101

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Ultrium Tape Library Specialist

Name: RASRMU (IBM ULT3583-TL)

Status **Configuration** Firmware Diagnostics file Operator panel Logs

Network Configuration		User Configuration	
Hostname	<input type="text" value="RASRMU"/>	Management Action	<input type="text" value="No Action"/>
IP Address	<input type="text" value="192.1.1.101"/>	User Name	<input type="text" value="admin"/>
Subnet Mask	<input type="text" value="255.255.255.0"/>	Password	<input type="text"/>
Gateway	<input type="text" value="192.1.1.0"/>	Re-enter Password	<input type="text"/>
SNMP Configuration		Date and Time	
SNMP Enabled	<input type="text" value="OFF"/>	Date (mm/dd/yy)	<input type="text" value="01/24/05"/>
Alerts Enabled	<input type="text" value="OFF"/>	Time (hh:mm)	<input type="text" value="13:32"/>
Manager (s)	<input type="text" value="0.0.0.0"/>	Synchronization with NTP Server	<input type="text" value="OFF"/>
Public Name	<input type="text" value="public"/>	NTP Server IP Address	<input type="text" value="0.0.0.0"/>
Private Name	<input type="text" value="private"/>	TimeZone	<input type="text" value="-07:00"/> list of timezones
Reboot			

Submit Reset

a671o179

Figure 14-65. Configuration page

8. Verify that the TotalStorage Specialist functions are operational (see “TotalStorage Specialist Menu Description” on page 3-8).

Step 19. Verify Firmware Levels

Refer to the following sections for information on verifying:

- “Library Firmware”
- “Drive Firmware” on page 14-60
- “RMU Firmware” on page 14-60
- “SAN Data Gateway Firmware” on page 14-61

Library Firmware

To determine the current version of library code installed using the operator panel:

1. Navigate to the About... Menu. For instructions, see “Accessing the About the Library (About...) Menu” on page 4-10.

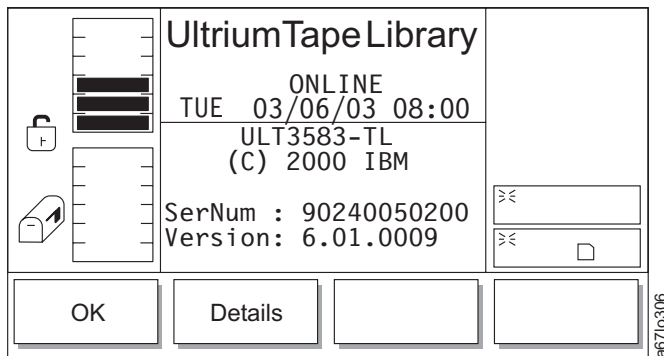


Figure 14-66. About Menu

2. Record the library serial number (SerNum) and firmware version (Version) on the Library Configuration Form.
3. Press the button below the **OK** softkey to return to the Main Menu (alternate screen).
4. Press the button below the **Back** softkey to return to the Main Menu screen.

RMU Firmware

To determine the current version of RMU code using the operator panel:

1. Navigate to the About Menu. For instructions, see “Accessing the About the Library (About...) Menu” on page 4-10.
2. Press the button below the **Details** softkey.

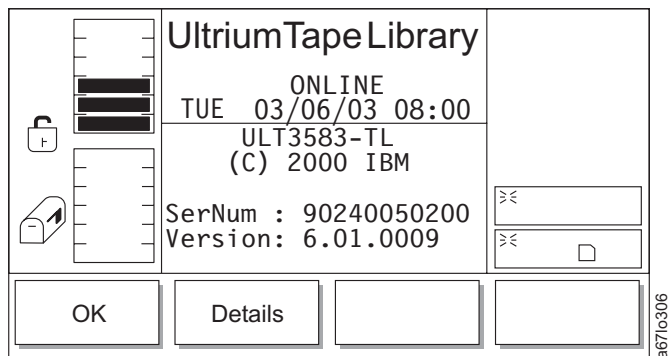


Figure 14-67. About Menu

3. Continue to press the button below the **Details** softkey until RMU displays.

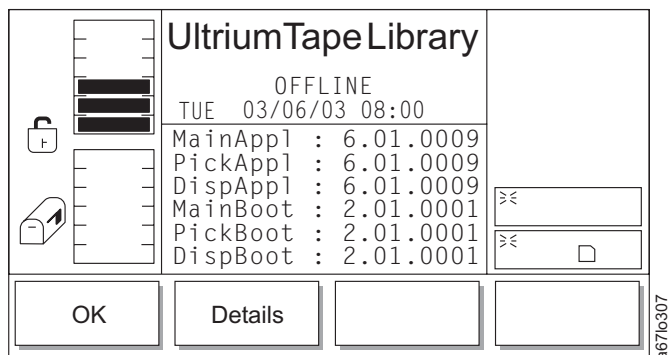


Figure 14-68. Details Dialog

4. Record the firmware version (RMU) on the Library Configuration Form.

Drive Firmware

To determine the current version of drive code installed using the operator panel:

1. Navigate to the Status Menu. For instructions, see “Accessing the Status Menu” on page 4-6.

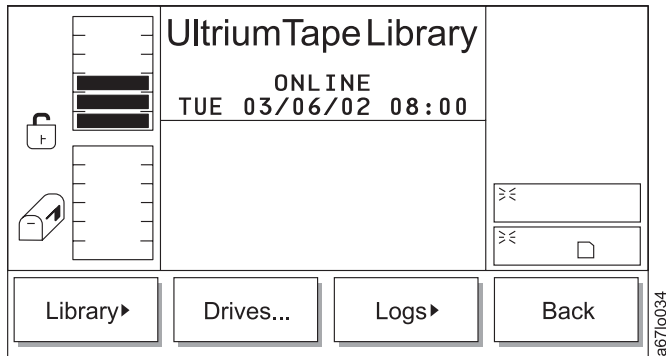


Figure 14-69. Status Menu

- Record the drive type (Type), serial number (SerNum), firmware version (Version), and SCSI/Loop ID (ID) for each drive in the library on the Library Configuration Form. To select another drive, press the button below the **Change Drive** softkey.

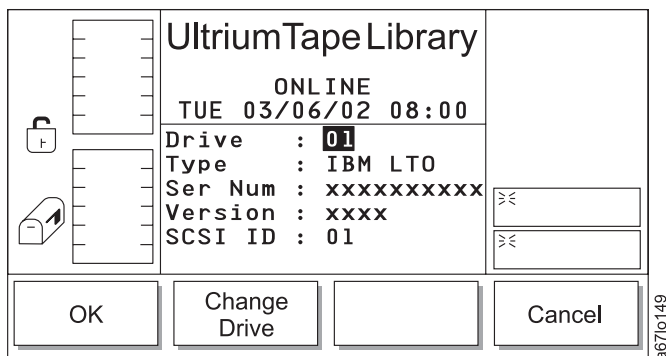


Figure 14-70. Status Menu

- After determining the firmware levels of all installed drives, press the button below the **OK** softkey.

SAN Data Gateway Firmware

Note: This feature is not supported with Ultrium 3 drives.

- Start the StorWatch Specialist server application if not already started.
- Start the StorWatch Specialist client application if not already started.
- Connect the server (this is automatically done if the server and client are started and run on the same system).
- Log on to the server.

Note: For information about starting the StorWatch Specialist server and client for Solaris, AIX, and other platforms, refer to the following web site at: <http://www.ibm.com/storage/lto>.

- To start the server using Windows NT
 - Click Start.
 - Click Programs → StorWatch Specialist → Server.
- To start the server using Windows 2000
 - Click Start.
 - Click Programs → StorWatch Specialist → Client.

- ___ 5. To log on, type "Admin" in the Enter User Name field and type "password" (or current password) in the Enter Password field, then click OK. Refer to Figure 14-71 and Figure 14-72.

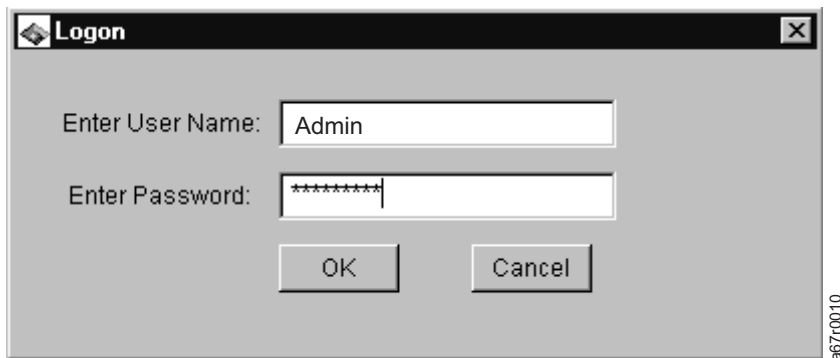


Figure 14-71. Logging on to the Server

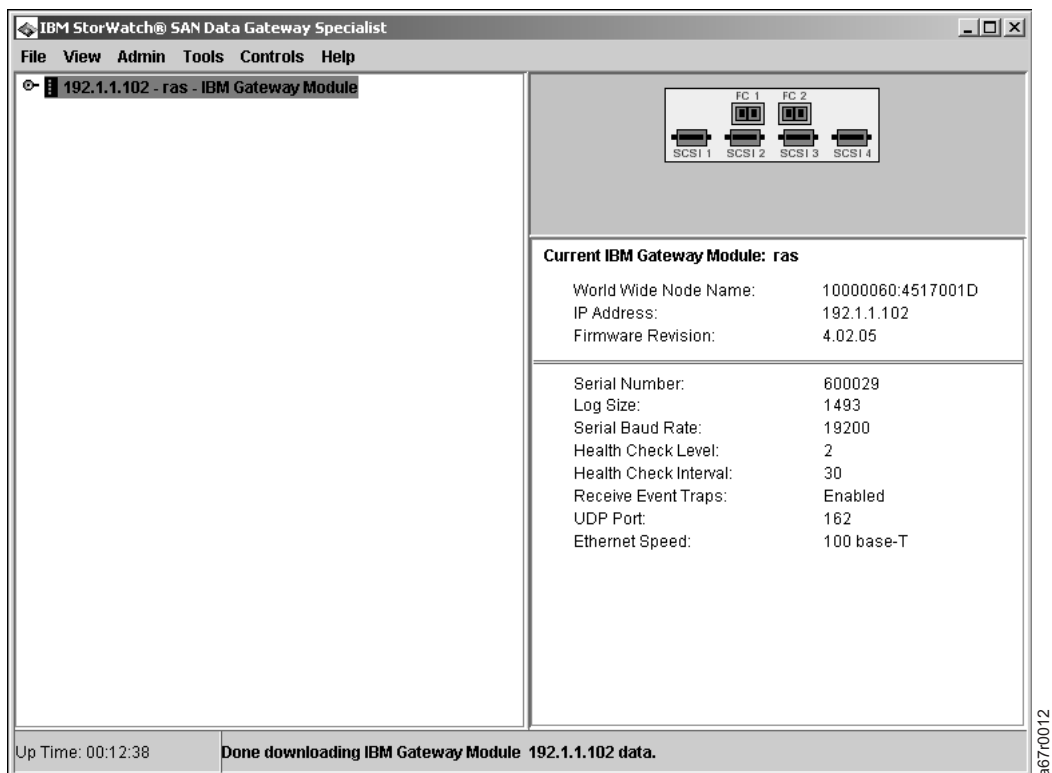


Figure 14-72. Initial Tree View

Note: Ensure the IBM Gateway Module is highlighted.

Updating Firmware



Refer to "Updating Firmware" on page 4-114 to:

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

Note: If you choose to update the firmware by using the SCSI bus, you must first install the IBM device drivers (see “Step 20. Install a SCSI Host Adapter Card (if required)” on page 14-64). Instructions for determining compatible device drivers are given in “Supported Device Drivers” on page 1-31. If your configuration uses the IBM AS/400 or iSeries server, do not install IBM device drivers (they are already installed).

Step 20. Install a SCSI Host Adapter Card (if required)

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

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

To install an adapter, refer to the instructions that accompany it, as well as to the section about SCSI card installation in the documentation for your server. For a list of supported adapters and required interposers, go to the Technical Support section on the web at <http://www.ibm.com/storage/1to>.

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

Step 21. Install Device Drivers and Backup Software

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

- If you intend to use the library with existing or new commercial backup application software (see “Supported Servers, Operating Systems, and Software” on page 1-31), refer to that application’s installation instructions to install the device driver and to configure the library. IBM recommends that you do not install any device driver from the CD that was shipped with the tape drive. Conflicts could occur over which driver controls the drive. Only install a device driver from the CD if the instructions from your backup application software tell you to do so. Do not install IBM device drivers if your configuration uses the IBM AS/400 or iSeries server; they are already installed.
- If you do not intend to use the library with commercial backup application software, install the device driver from the CD that was shipped with the library. Refer to the installation instructions in the *Ultrium Device Driver Installation and User’s Guide*, which is on the CD and also included in published form. The CD contains drivers and installation instructions for the supported operating systems.

Step 22. Configure the Tape Library to the Server

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

Step 23. Store Manuals and Documentation

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

Chapter 15. Parts List

This section include a list of field replaceable units (FRUs) for the Ultrium Scalable Tape Library. It also includes a list of compatible power cords.

Table 15-1. Parts List for Ultrium Scalable Tape Library

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
Boards	Power Distribution Board (Type II, required for Fibre Channel support)	19P3255	8-49
	Power Distribution Board (Type I)	19P1749	8-49
	Main Controller Board	19P3467	8-34
	Host SCSI Interface Board (without Multi-Path feature)	35L1068	8-45
	Serial Diagnostic Port Board (with Multi-Path feature)	18P8171	8-46
	Picker Control Board	19P3469	8-16
	Display Assembly	19P3468	8-47
Modules	Remote Management Unit (RMU)	19P3254	8-39
	GBIC (2 Gbit)	19P3259	8-41
Power	DC Power Supply Module (Type II, required for Fibre Channel support)	19P3256	8-54
	DC Power Supply Module (Type I)	35L1071	8-54
	AC Input Power Module	35L1072	8-53
Tape Drive Sleds	LTO 3 LVD Ultra160 Drive Sled	96P1561	8-4
	LTO 3 Fibre Channel Drive Sled	96P1562	8-4
	Ultrium 2 Tape Drive Sled (LTO - LVD)	18P8157	8-4
	Ultrium 2 Tape Drive Sled (LTO - HVD)	18P8158	8-4
	Ultrium 1 Tape Drive Sled (LTO - LVD)	19P3978	8-4
	Ultrium 1 Tape Drive Sled (LTO - HVD)	35L1080	8-4
	Ultrium 2 Tape Drive Sled (LTO - Fibre Channel)	18P8159	8-4
Terminators (SCSI)	LVD	19P0874	Not applicable
	HVD	61G8324	Not applicable
Wrap Tool (SCSI)	LVD	19P0481	9-30
	HVD	19P1213	9-30
Fibre Channel Wrap Tool	LC Wrap Tool	11P3847	9-30
Interposers (SCSI)	VHDCI-to-HD68	19P0482	Not applicable
Interposers (Fibre)	SC-to-LC	11P1373	Not applicable
Fuses	AC Input (5 amp)	19P1665	8-53

Table 15-1. Parts List for Ultrium Scalable Tape Library (continued)

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
Mechanical Parts	Y-Axis Motor Assembly	35L1077	8-29
	Picker Assembly	19P3470	8-7
	Picker Arm Carriage Assembly	18P7450	8-11
	Library Front Door Key	35L1086	Not applicable
	Door Lock Assembly	35L1095	8-57
	I/O Station Assembly (Single Slot) - LTO	19P5284	8-52
	I/O Station Assembly (Multiple Slot) - LTO	19P4531	8-50
	Rotary Axis Motor Assembly	35L1076	8-14
	Storage Column (LTO)	19P4530	8-32
	Storage Magazine (LTO)	19P4529	Not applicable
	Y-Axis Drive Belt	19P5666	8-18
	Top Plastic Door Cover	35L1089	8-59
	Plastic Lower Grill	35L1090	8-60
	Side Cover	35L1091	8-61
	Drive Filler Panel	35L1093	8-7
	Library Top Cover	19P1281	8-62
	Caster Kit	35L1092	See the section about installing the library in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>
Screw Kit	18P9169		
Cables	Cable between Main Controller Board and Display Control Board	35L1081	8-25
	Cable between Main Controller Board and Picker Control Board	35L1082	8-24
	Cable between Power Distribution Board and Individual Drive Sled	35L1083	8-28
	Signal Cable between Main Controller Board and Power Distribution Board	35L1084	8-27
	Power Cable between Main Controller Board and Power Distribution Board	35L1085	8-27
	Door Interlock Switch Cable and Cable Assembly	35L1094	8-58
	Cable between Power Distribution Board and SAN Data Gateway Module (Accessory Bay Cable)	19P3257	8-42
	Serial Cable (Straight Through)	19P1945	4-114
	RMU Interface Cable	19P5364	8-36
	RJ45 Crossover Cable	09L0294	9-6
	Cable Retainer Clips	19P5362	Not applicable

Table 15-1. Parts List for Ultrium Scalable Tape Library (continued)

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
Cables, Universal HD68-to-HD68 ((LVD/HVD) SCSI)	Cable, 0.41 m	19P0872	Not applicable
	Cable, 0.72 m	19P0873	Not applicable
	Cable, 5.0 m	19P0052	Not applicable
	Cable, 10 m	19P0053	Not applicable
	Cable, 25 m	19P0054	Not applicable
Cables, Universal VHDCI-to-HD68 ((LVD/HVD) SCSI)	Cable, 0.6 m	19P3132	Not applicable
	Cable, 2.5 m	19P0279	Not applicable
	Cable, 4.5 m	19P0050	Not applicable
	Cable, 10 m	19P0048	Not applicable
	Cable, 20 m	19P0049	Not applicable
	Cable, 25 m	35L1977	Not applicable
Cables, SC-to-SC (Fibre Channel)	Cable, 5 m	03K9201	Not applicable
	Cable, 25 m	03K9204	Not applicable
	Cable, 61 m	54G3390	Not applicable
Cables, LC-to-LC (Fibre Channel)	Cable, 5 m	18P8693	Not applicable
	Cable, 13 m	18P8694	Not applicable
	Cable, 25 m	18P8695	Not applicable
	Cable, 61 m	18P8696	Not applicable
Cables, SC-to-LC (Fibre Channel)	Cable, 7 m	11P1345	Not applicable
	Cable, 13 m	11P1346	Not applicable
	Cable, 25 m	11P1347	Not applicable
	Cable, 61 m	11P1350	Not applicable

Other Available Parts

Table 15-2. Other Available Parts

Part Name	Part Number	Refer to...
Kits		
Rack Mount Kit with Rack Power Cord	35L1559	See the section about installing the library in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>
SAN Data Gateway Module Service Accessory Kit: <ul style="list-style-type: none">• VHDCI-to-VHDCI SCSI wrap cable (0.5 m)• SC-to-SC Fibre Channel coupler block• Gateway service tools:<ul style="list-style-type: none">– Null modem cable– Ethernet wrap tool– Fibre Channel wrap tool	19P3461	Included in Ship Group; see the inventory checklist located in the section about installing the library in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>
Cables, Power		
Rack Mount Power Cable	05H8911	See the section about installing the library in the <i>IBM TotalStorage 3583 Tape Library Setup and Operator Guide</i>
All Other Library Power Cords		"Power Cords"

Power Cords



To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

"Power Cords" 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 "Power Cords." These power cords are only available at the time of initial purchase or as a field replaceable unit (FRU) part from your IBM Service Representative.

All power cords use an appliance coupler that complies with the International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

If the power cord that you receive does not match your receptacle, contact your local dealer.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL), are certified by the Canadian Standards Association (CSA), and comply with the plug standards of the National Electrical Manufacturers Association (NEMA). For other worldwide geographies, plug standards are listed in "Power Cords."

Power Cord Information

Table 15-3. Power cord information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 15-1 on page 15-7
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 13F9940	AS 3112 NZN 198	Argentina, Australia, China, Colombia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	3
France, Germany 2.8 m, 250V FC 9820 PN 13F9979	CEE 7 - VII	Afghanistan, Algeria, Andorra, Angola, Aruba, Austria, Belgium, Benin, Brazil, Bulgaria, 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

Table 15-3. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 15-1 on page 15-7
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
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 15-1 on page 15-7 shows the plugs that are used by the power cords in Table 15-3 on page 15-5. Match the index number that is beside each plug to the index number in the table.

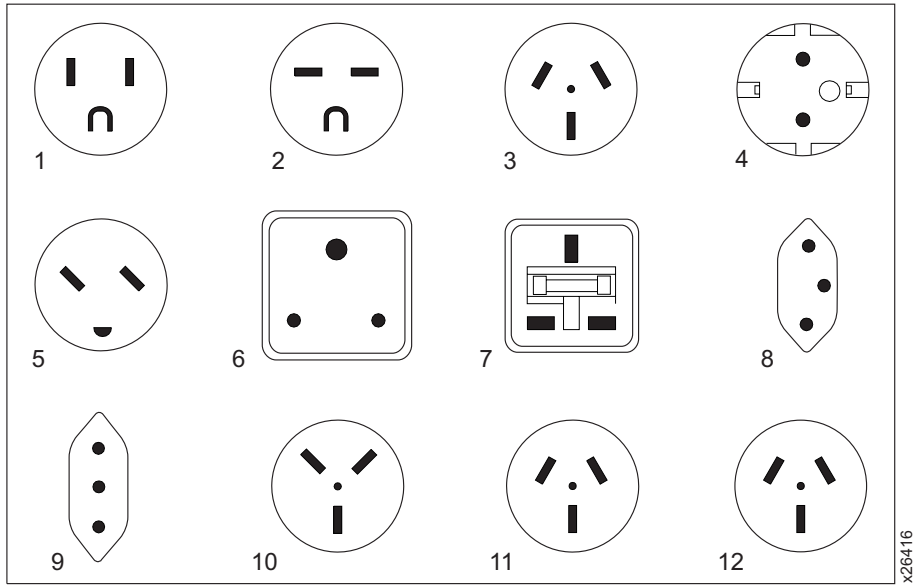


Figure 15-1. Types of receptacles

TapeAlert Flags

This appendix is intended to provide additional information to the reader about the tape drive. All error code and diagnostic information contained in this chapter can be accessed from the Operator Panel of the Library. The drive portion of the Operator Panel Display will contain any drive error codes. Therefore there is no need to open the Library to access the buttons on the drive as described in this chapter. See IBM TotalStorage 3583 Tape Library Setup and Operator Guide for a complete description of the Operator Panel functions and Displays.

TapeAlert is a standard that defines status conditions and problems experienced by devices such as tape drives, autoloaders, and libraries. The standard enables a server to read TapeAlert messages (called *flags*) from a tape drive via the SCSI bus. The server reads the flags from Log Sense Page 0x2E.

The Ultrium Scalable Tape Library is compatible with TapeAlert technology, which provides error and diagnostic information about the drives and the library to the server. Because library and drive firmware may change periodically, the SNMP interface in the library does not require code changes if devices add additional TapeAlerts that are not supported today. However, should this occur the MIB is written to minimize impact to the SNMP monitoring station. At the time of this writing, the TapeAlert flags in this appendix correctly represent TapeAlerts that will be sent. The MIB file should not be taken to mean that all traps that are defined in the MIB will be sent by the library or that they will be sent in the future.

This appendix lists TapeAlert flags that are supported by the Ultrium Tape Drives and the Ultrium Scalable Tape Library.

TapeAlert Flags Supported by the Drive

Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive

Flag Number	Flag	Description	Action Required
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
4	Media	Set for any unrecoverable read, write, or positioning error that is due to a faulty tape cartridge.	Replace the tape cartridge.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 in Table 6-4 on page 6-25.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see "Setting the Write-Protect Switch" on page A-4). If Flag Number 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 page Table 6-4 on page 6-25.
8	Not data grade	Set when the cartridge is not data-grade. Any data that you write to the tape is at risk.	Replace the tape with a data-grade tape.

Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive (continued)


Flag Number	Flag	Description	Action Required
9	Write protect	Set when the tape drive detects that the tape cartridge is write-protected.	Make sure that the cartridge's write-protect switch is set so that the tape drive can write data to the tape (see "Setting the Write-Protect Switch" on page A-4).
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 operation failed because the tape in the drive snapped.	Do not attempt to extract the old tape cartridge. Call the tape drive supplier's help line.
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the tape cartridge. If this error occurs on multiple cartridges, see Error Code 6 in Table 6-4 on page 6-25
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read all data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive (see the section about cleaning drives in the <i>IBM TotalStorage 3583 Tape Library Planning and Operator Guide</i>).
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon. See the section about cleaning drives in the <i>IBM TotalStorage 3583 Tape Library Planning and Operator Guide</i> .
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs that requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see Table 6-4 on page 6-25 for the appropriate instructions.

Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive (continued)

Flag Number	Flag	Description	Action Required
31	Hardware B	Set when the tape drive fails its internal Power-On Self Tests.	Note the error code on the single-character display and see Table 6-4 on page 6-25 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI, Fibre Channel, or RS-422 interface.	Locate Error Code 8 or 9 in Table 6-4 on page 6-25
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive.	Unload the tape cartridge, then reinsert it and restart the operation.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive through the SCSI or Fibre Channel interface.	Ensure that it is the correct FMR image. Download the FMR image again.
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the library.	See Error Code 1 in Table 6-4 on page 6-25
37	Drive voltage	Set when the drive detects that the externally supplied voltages are either approaching the specified voltage limits or are outside the voltage limits (see Table 1-8 on page 1-25).	See Error Code 2 in Table 6-4 on page 6-25
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	See Error Code 6 in Table 6-4 on page 6-25
51	Tape directory invalid at unload	Set when the tape directory on the tape cartridge that was previously unloaded is corrupted. The file-search performance is degraded.	Use your backup software to rebuild the tape directory by reading all the data.
52	Tape system area write failure	Set when the tape cartridge that was previously unloaded could not write its system area successfully.	Copy the data to another tape cartridge, then discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at load time.	Copy the data to another tape cartridge, then discard the old cartridge.

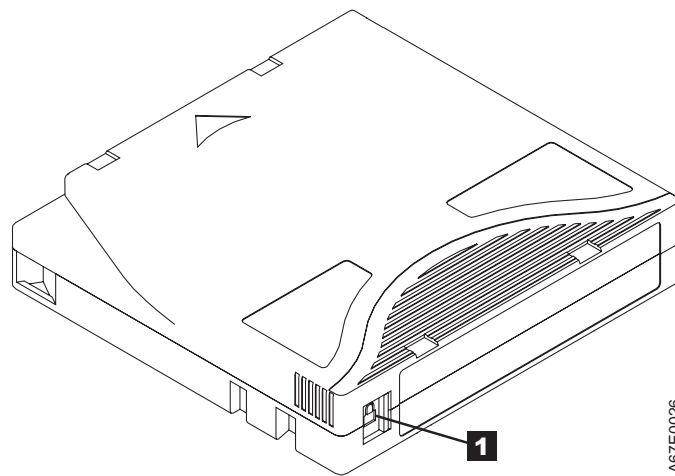
Setting the Write-Protect Switch

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

- If the switch is set to  (solid red), data cannot be written to the tape.
- If the switch is set to unlocked (black void), data can be written to the tape.

Advise your customer that it is better to use the host application software to write protect the cartridges instead of manually using the write protect switch. The host software will identify a cartridge that no longer contains current data. The host software will then make a scratch cartridge by removing the software generated write protect.

If you must manually set the write-protect switch **1**, slide it left or right to the desired position.



A67E0026

Figure A-1. Cartridge Write-Protect Switch

TapeAlert Flags Supported by the Library

Table A-2. TapeAlert Flags Supported by the Tape 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.
7	Predictive failure	Predictive failure of library hardware.	Not applicable.
8	Library maintenance	Library Preventive Maintenance required.	Not applicable.
13	Library pick retry	The operation to pick a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
14	Library place retry	The operation to place a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
15	Library load retry	The operation to load a cartridge into a drive had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
16	Library door	A library door is open and prevents the library from functioning.	Close the library door.
17	Library I/O station	A problem exists with the I/O station.	<ol style="list-style-type: none"> 1. Ensure that there is no obstruction in the I/O station. 2. Restart the operation.
19	Library security	Library door opened then closed during operation.	Library security has been compromised.
20	Library security mode	Library security mode changed.	The security mode of the library has been changed. For information purposes only. No action required.
21	Library offline	Library manually turned offline.	The library has been manually turned offline and is unavailable for use.
23	Library scan retry	The operation to scan the bar code on a cartridge had to perform an excessive number of retries before succeeding. A potential problem exists with the bar code label or the reader hardware in the library mechanism.	Check for damaged, misaligned, or peeling bar code labels on cartridges.
24	Library inventory	An inventory of the media was inconsistent.	<ol style="list-style-type: none"> 1. Run a library inventory to correct the inconsistency. 2. Restart the operation.
28	Power supply	A redundant power supply failure exists inside the library.	Contact your IBM Technical Support
32	Unreadable bar code label	During an inventory or scan, the library was unable to read a bar code label on a cartridge.	Check for damaged, misaligned, or peeling bar code labels on the cartridge.

Resolving Problems

If you encounter problems when running the Ultrium Tape Drive, refer to Table A-3. If the problem is not identified in Table A-3, refer to “Methods of Receiving Errors and Messages” on page A-7.

Table A-3. Troubleshooting Tips for the Ultrium Tape Drive

If the problem is this....	Do this....
A code displays on the single-character display.	The Ultrium Tape Drive detected an error or is directing you to an informational message. See Table 6-4 on page 6-25.
The status light or single-character display never turns on.	The Ultrium Tape Drive has not been properly terminated or has no power. If the SCSI bus is terminated externally, try a different terminator or use the drive’s internal termination. If the SCSI bus is terminated properly, check the power at the power source. Ensure the tape drive sled is connected properly, (see “Tape Drive Sled” on page 8-4). If the problem persists, replace the tape drive sled.
The Ultrium Tape Drive won’t load a tape cartridge.	<p>One of the following has occurred:</p> <ul style="list-style-type: none"> • A tape cartridge is already inserted. To remove the cartridge, press the unload button. If the cartridge does not eject, turn off the power to Ultrium Tape Drive, then turn it back on and press the unload button. • The tape cartridge was inserted incorrectly. To properly insert a cartridge, see “Inserting a Tape Cartridge” on page A-17. • The tape cartridge was defective. Insert another tape cartridge. If the problem persists, replace the tape drive sled (see “Tape Drive Sled” on page 8-4). • The Ultrium Tape Drive has no power. Ensure the drive sled is plugged into the Library correctly. (See “Tape Drive Sled” on page 8-4.) If there are multiple drives in the library and the other drives are powered up correctly, suspect the power cable or power distribution card. • If the problem exists for multiple cartridges, the Ultrium Tape Drive is defective. Replace the tape drive (see “Tape Drive Sled” on page 8-4).
The Ultrium Tape Drive won’t unload the tape cartridge.	The tape cartridge is stuck or is broken. Press the unload button. If the cartridge does not eject, turn off the power to Ultrium Tape Drive, then turn it back on. If the cartridge still does not eject, manually remove it (see “Removing a Tape Cartridge” on page B-1).
The host received TapeAlert messages.	See “TapeAlert Flags” on page A-1.
The host reported SCSI problems (such as selection or command time-outs, or parity errors).	See “Resolving Problems Reported to the Server” on page A-9.
A library reported an interface problem.	Run drive diagnostics. The drive sled or RS-422 circuitry may be defective. Refer to the section about running drive diagnostics in the <i>IBM TotalStorage 3583 Tape Library Planning and Operator Guide</i> .
Codes display on the single-character display, but the status light doesn’t turn on.	The Ultrium Tape Drive is defective. Replace the tape drive sled, (see “Tape Drive Sled” on page 8-4).

Methods of Receiving Errors and Messages

Use Table A-4 as a guide for identifying error and message codes reported to the Ultrium Tape Drive, library, or host.

Note: The codes on the single-character display have different meanings, depending on whether they display during normal operations or while the drive is in maintenance mode. Codes that occur during normal operations are defined in Table 6-4 on page 6-25. Codes that occur while in maintenance mode are defined in Table A-8 on page A-19

Table A-4. Methods of Receiving Errors and Messages for the Ultrium Tape Drive

If the error or message was presented by...	Do this....
The library's display (if the tape drive is enclosed in a library or autoloader)	See "Maintenance Starting Point" on page 5-2.
The tape drive's single-character display and the status light flashes yellow	See Table 6-4 on page 6-25. To determine the meaning of status light activity, see "Status Light" on page A-16.
The tape drive's single-character display and the status light is solid yellow	See Table A-8 on page A-19. To determine the meaning of status light activity, see "Status Light" on page A-16.
SCSI log sense data (such as TapeAlert flags) or request sense data at the host console	See "TapeAlert Flags" on page A-1, Table 6-4 on page 6-25, Chapter 10, "Messages," on page 10-1, Chapter 11, "Sense," on page 11-1, or "Using Host Sense Data" on page A-8.
Drive sense data sent to a library (if the tape drive is enclosed in a library)	See "Maintenance Starting Point" on page 5-2, Chapter 10, "Messages," on page 10-1, and Chapter 11, "Sense," on page 11-1, then see Table 6-4 on page 6-25
The tape drive's error log	See Table 6-4 on page 6-25 and "Viewing the Drive Error Log" on page A-9

Descriptions and Corrective Actions for Errors and Messages

For a description of the errors and messages that pertain to the Ultrium Tape Drive, see "Drive Error Codes" on page 6-25.

Using Host Sense Data

Table A-5 lists the hosts to which the Ultrium Tape Drive attaches. It gives the operating system for each host and describes how the host records errors from the Ultrium Tape Drive.

To determine the meaning of host sense data, see Chapter 10, "Messages," on page 10-1 and Chapter 11, "Sense," on page 11-1. Also refer to the *IBM Ultrium Device Drivers Installation and User's Guide* or visit the web at <http://www.ibm.com/storage/1to>.

Table A-5. 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 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 <code>/var/adm/messages</code> .
Intel-based PCs	Windows-based operating systems	Uses the NTUTIL device driver to log some sense data in the Event Viewer host log.

Viewing the Drive Error Log

The Ultrium Tape Drive keeps an error log that you can use to identify and correct errors. The log contains the 10 most recent error codes, which appear (one at a time) on the single-character display.

To view the drive error log:

1. Make sure that no cartridge is in the drive.
2. Within a 1 second interval press the unload button 3 times. The status light becomes solid amber, indicating that the drive is in maintenance mode.

Note: If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

3. Press the unload button once per second until **9** appears in the single-character display.

Note: If you cycle past the desired code, press the unload button once per second until the code redisplay.

4. Press the unload button to view the most recent error code.
5. Refer to Table 6-4 on page 6-25 to determine the meaning of the code and the action to take.
6. Press the unload button to view the next error code. (The codes are ordered; the most recent is presented first and the oldest (tenth) is presented last. Each time you press the unload button to view an error, the single-character display turns on, the error displays, then the single-character display turns off.)
7. Continue to press the unload button until the 10 error codes have been displayed. After you display the tenth error code, the Ultrium Tape Drive automatically exits maintenance mode.

To re-display the error codes, repeat steps 1-7.

This function is also available from the library's operator panel by selecting **Main Menu** → **Status** → **Logs** → **Drive Log**.

Resolving Problems Reported to the Server

Fixing SCSI Bus Errors

Note: If you are using a Storage Area Network (SAN) Data Gateway to convert a drive with a SCSI interface to a Fibre Channel interface, ensure that the problem is occurring between the SAN Data Gateway and the drive by running the SCSI wrap test on the drive and running the SCSI loopback test on the SAN Data Gateway. (To run the SCSI wrap test, see Function Code 6 in Table A-8 on page A-19; to run the SCSI loopback test, refer to the section about that test in the *IBM Storage Area Network Gateway Module Setup, Operator, and Service Guide*.) If you are using a Fibre Channel drive and are having problems, see "Fixing Fibre Channel Errors" on page A-11.

Fixing a Consistent Error with a Single Drive on a SCSI Bus

1. Ensure that the power is on to the Ultrium Tape Drive.
2. Ensure that the tape drive's SCSI address is the same as the SCSI address assigned by the server.
3. Run the SCSI wrap test (see Function Code 6 in Table A-8 on page A-19).
 - 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 "Tape Drive Sled" on page 8-4).

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.

1. Ensure that the SCSI cable from the server to the first device is connected.
2. Disconnect all but the first tape drive on the SCSI bus. Move the terminator to the first SCSI device.
3. Run a device driver utility (such as IBM's *ntutil* or *tapeutil*) to determine whether the error will occur.
 - If the error occurs, run the SCSI wrap test on the first tape drive (see Function Code 6 in Table A-8 on page A-19).
 - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable and the interposer (if installed) to the first tape drive. 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 "Tape Drive Sled" on page 8-4).
 - If the error does not occur, connect one tape drive at a time back to the bus and repeat step 3 for each tape drive until you can identify which drive is defective.

Note: Ensure that the SCSI terminator is always on the last tape drive on the SCSI bus.

4. Determine if the problem is with only one tape drive or with two or more tape drives.
 - If the problem is with only one tape drive, run the SCSI wrap test on that tape drive (see Function Code 6 in Table A-8 on page A-19).
 - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable to that tape drive and interposer (if installed).
 - If the test fails, replace the tape drive (see "Tape Drive Sled" on page 8-4).
 - If the problem is with two or more tape drives, locate the first tape drive that has the error and replace the SCSI cable that connects the tape drive and the interposer (if installed).

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 Ultrium Tape Drive.
4. Replace the tape drive (see "Tape Drive Sled" on page 8-4). 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 "Tape Drive Sled" on page 8-4).
- 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.

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 A-9.

Supported Topologies

- I The Ultrium 2 tape drive and the Ultrium 3 tape drive 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 do so in a Point-to-Point topology (through an N_port or F_port) or Arbitrated Loop topology (through an L_port or FL_port).
- I The Ultrium 2 tape drive and the Ultrium 3 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 direct connection to another N_port or to an F_port (for example, a director-class switch) in a point-to-point topology.

Regardless of the port to which you connect the drive, it automatically configures to a public device (through an F_port or FL_port to a switch) or to a private device (through an N_port or L_port by using direct attachment to a server).

- I Table A-6 lists the topologies in which the Ultrium 2 tape drive and the Ultrium 3 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 A-6. 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
Point-to-Point (two nodes)	N_Port	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 A-11). 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/1to>.
 - Contact your IBM Sales Representative.
4. Ensure that the Fibre Channel cables are installed correctly. Refer to the appropriate steps about cabling in the installation section of the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.

5. Go to one of the following procedures:
 - “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop”
 - “Fixing a Consistent Error with Multiple Drives on a Fibre Channel Loop”
 - “Fixing a Consistent Error in a Point-to-Point Topology” on page A-13
 - “Fixing Intermittent Fibre Channel Errors” on page A-14

Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop

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. 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 the section about setting Fibre Channel Loop IDs in the installation chapter of the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*). 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 Function Code 6 in Table A-8 on page A-19).
 - 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 Function Code 6 in Table A-8 on page A-19).
 - 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 a Consistent Error with Multiple Drives on a Fibre Channel Loop

Use the following procedure to determine if all of the drives on the Fibre Channel have the problem:

1. Use a device driver utility (such as *ntutil* or *tapeutil*) to verify that the drive is available and properly configured at the server.
2. Determine the type of Fibre Channel topology that you are using (see “Supported Topologies” on page A-11).
3. Using this guide or the service guides of associated switch, hub, or fiber products, try to isolate which part of the Fibre Channel Storage Area Network (SAN) is experiencing problems.
4. Perform one of the following:
 - If the problem exists on a small number of drives, go to “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop.”
 - If the problem exists with a large number of drives, perform the following steps:
 - a. Disconnect all except one failing drive on the Fibre Channel.
 - b. Run the Fibre Channel wrap test to determine if a failure occurs on that drive (see Function Code 6 in Table A-8 on page A-19). If it does, perform the procedure in “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop.”
 - c. Continue to connect one drive at a time to the Fibre Channel loop.
5. When the problem is corrected, restore all of the Fibre Channel cables to their correct position.

Fixing a Consistent Error in a Point-to-Point Topology

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. Ensure that the drive is connected to the host or switch. The 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 Function Code 6 in Table A-8 on page A-19).
 - 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 Function Code 6 in Table A-8 on page A-19).
 - 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 A-11).
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/1to>.
 - Contact your IBM Sales Representative.
3. Check that each Fibre Channel cable does not exceed 500 m (1640 ft).
4. Ensure that all Fibre Channel cables are installed correctly. Refer to the appropriate steps about cabling in the installation section of the *IBM TotalStorage 3583 Tape Library Setup and Operator Guide*.
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 A-8), then contact your OEM Product Application Engineer (PAE) for error analysis.

Resolving Media-Related Problems

To resolve problems that are related to media, the Ultrium Tape Drive includes:

- Test Cartridge & Media diagnostic that verifies whether a suspect cartridge and its magnetic tape are acceptable for use (see Function E in Table A-8 on page A-19).
- A Statistical Analysis and Reporting System (SARS) to assist 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 (see “TapeAlert Flags” on page A-1).

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 tape 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 tape 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 Test Cartridge & Media diagnostic (see Function Code E in Table A-8 on page A-19).
2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, clean the tape drive and run the tape drive diagnostics (see the section about running drive diagnostics in the *IBM TotalStorage 3583 Tape Library Planning and Operator Guide* and Function Code 1 in Table A-8 on page A-19).
3. If the tape drive diagnostics fail, replace the tape drive sled, see “Tape Drive Sled” on page 8-4. If the tape drive diagnostics run successfully, perform the operation that produced the initial media error.

Operating the Tape Drive

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

When operating the Ultrium Tape Drive, refer to Figure A-2 which shows the front of the unit.

- | | | | |
|----------|---------------|----------|--------------------------|
| 1 | Unload button | 3 | Single-character display |
| 2 | Status light | | |

| **Note:** Ultrium 2 and Ultrium 3 tape drives have similar operator panels. Ultrium 2 is shown in Figure A-2.

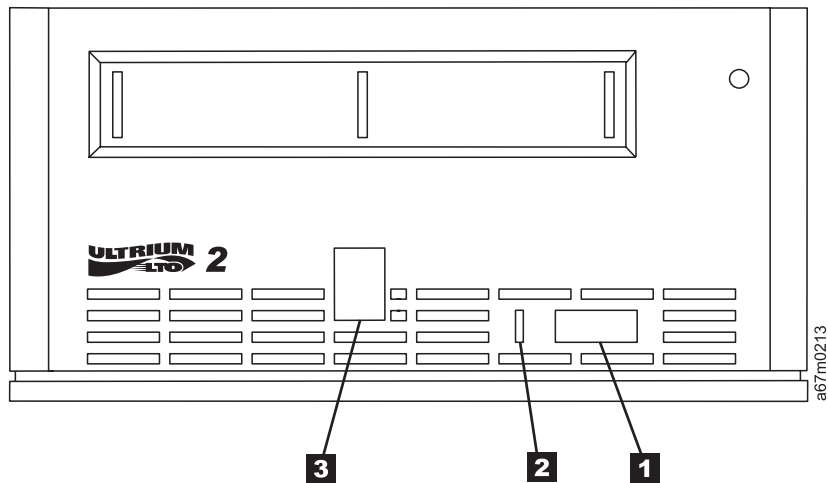


Figure A-2. Front view of the Ultrium Tape Drive

Status Light

The status light (**2** in Figure A-2 on page A-15) is a light-emitting diode (LED) that provides information about the state of the Ultrium Tape Drives. The light can be green or amber, and (when lit) solid or flashing. Table A-7 lists the conditions of the status light and provides an explanation of what each condition means.

Table A-7. Meaning of Status Light Activity

Color and Condition of Status Light	Meaning
Off	The tape drive has no power or is powered off.
Green/Solid	The tape drive is powered on and is idle.
Green/Flashing	The tape drive is reading from the tape, writing to the tape, rewinding the tape, locating data on the tape, loading the tape, or unloading the tape. The status light also flashes green if the tape drive contains a cartridge during the power-on cycle. In this case, the drive completes POST and slowly rewinds the tape (the process may take approximately 13 minutes). The light stops blinking and becomes solid when the drive completes the recovery and is ready for a read or write operation. To eject the cartridge, press the unload button.
Amber/Solid	The tape drive is powering on, is resetting, or is in maintenance mode. For information about the functions that are available when the drive is in maintenance mode, see “Selecting a Diagnostic or Maintenance Function” on page A-19.
Amber/Flashing	One of the following applies: <ul style="list-style-type: none">• If the light flashes once per second, an error occurred and the tape drive or media may require service. Note the code on the single-character display, then go to Table 6-4 on page 6-25 to determine the action that is required. If a solid C appears in the single-character display, the drive needs cleaning.• If the light flashes twice per second, the tape drive is updating firmware. For more information, see “Updating Firmware” on page 4-114.• If the light flashes four times per second, the tape drive detected an error and is performing a firmware recovery. It resets automatically.

Unload Button

The unload button (**1** in Figure A-2 on page A-15) enables you to perform the following functions:

- Rewind the tape into the cartridge and eject the cartridge from the tape drive. For more information, see “Removing a Tape Cartridge” on page A-18.
- Enter or exit maintenance mode, or perform diagnostic or maintenance functions. For more information, see “Selecting a Diagnostic or Maintenance Function” on page A-19.
- Perform a panic reset of the drive. **Attention:** If the tape drive detected a permanent error and displayed an error code, it automatically forces a drive dump (also known as a save of the firmware trace). If you perform a panic reset of the drive, the existing dump will be overwritten and lost. To perform a panic reset, press and hold the unload button on the drive for 10 seconds. The drive forces a dump and overwrites the existing dump. The drive then reboots to allow communication.

Single-Character Display

The Ultrium Tape Drive features a light-emitting diode (LED) (**3** in Figure A-2 on page A-15) that presents a single-character code for:

- Diagnostic or maintenance functions
- Error conditions and informational messages

Table A-8 on page A-19 lists each single-character code used for diagnostic or maintenance functions. Table 6-4 on page 6-25 lists the codes for error conditions and informational messages. If multiple errors

occur, the code with the highest priority (represented by the lowest number) displays first. When the error is corrected, the code with the next highest priority displays, and so on until no errors remain.

Single Red Dot

The single-character display is blank during normal operation. However, if a drive dump is present while the drive is in maintenance mode, a single red dot illuminates on the display. This indicator is for use by IBM Support personnel. To copy the dump to tape, see Function Code 5 in Table A-8 on page A-19.

The red dot turns off when you obtain the dump (by using a data cartridge, a SCSI command, or a library command). If no dump is present while the drive is in maintenance mode, the single red dot does not illuminate.

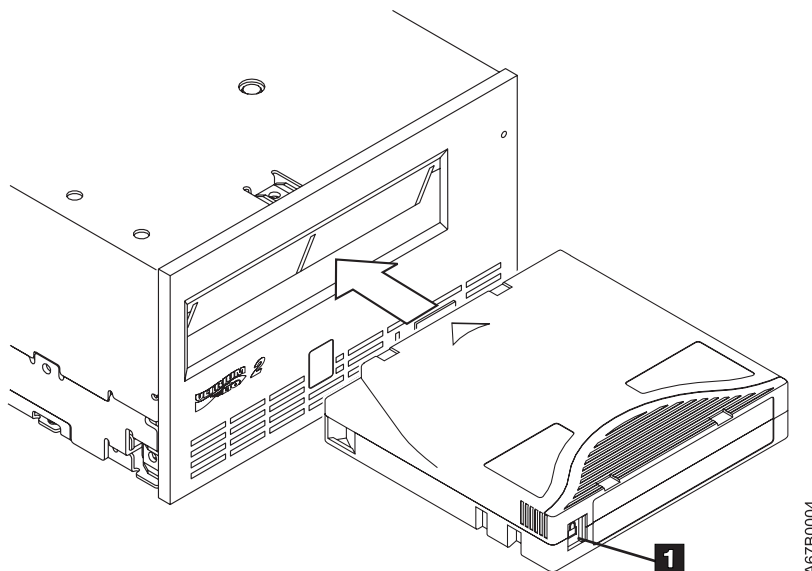
Inserting a Tape Cartridge

To insert a tape cartridge:

1. Ensure that the Ultrium Tape Drive is powered-on.
2. Ensure that the write-protect switch is properly set (see Figure A-1 on page A-4).
3. Grasp the cartridge so that the write-protect switch faces you (see **1** in Figure A-3).
4. Slide the cartridge into the tape load compartment.

Notes:

- a. If the cartridge is already in an ejected position and you want to reinsert it, remove the cartridge then insert it again.
- b. If the cartridge is already loaded and you cycle the power (turn it off, then on), the tape will reload.



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Figure A-3. Inserting a Cartridge into the Ultrium Tape Drive

Removing a Tape Cartridge

To remove a tape cartridge:

1. Ensure that the Ultrium Tape Drive is powered on.
2. Press the unload button. The drive rewinds the tape and partially ejects the cartridge. The status light flashes green while the tape rewinds, then goes out before the cartridge partially ejects.
3. After the cartridge partially ejects, grasp the cartridge and remove it.

If you are unable to remove the cartridge, see “Removing a Tape Cartridge” on page B-1. Whenever you unload a tape cartridge, the Ultrium Tape Drive writes any pertinent information to the cartridge memory.

Cleaning the Drive Head

Attention: To clean the drive head, use the IBM TotalStorage Cleaning Cartridge (Ultrium LTO 2), the IBM LTO Ultrium Cleaning Cartridge, or an IBM-approved cleaning cartridge.

Clean the drive head whenever **C** displays on the single-character display and the status light flashes amber. To clean the head, insert the cleaning cartridge into the tape load compartment (see Figure A-3 on page A-17). The drive performs the cleaning automatically. When the cleaning is finished, the drive ejects the cartridge. The cleaning cartridges are generally valid for 50 uses.

Automatic Cleaning

Automatic cleaning enables the Ultrium Scalable Tape Library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process. Automatic cleaning makes the cleaning process transparent to any host application that uses the library. You can enable or disable automatic cleaning by using the library's operator panel. The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. The cleaning cartridge must be located in a nonaddressable storage slot. For more information, see the section about enabling or disabling automatic cleaning in the *IBM TotalStorage 3583 Tape Library Planning and Operator Guide*.

Selecting a Diagnostic or Maintenance Function

The Ultrium 2 Tape Drive can run diagnostics, test write and read functions, test a suspect tape cartridge, update its own firmware, and perform other diagnostic and maintenance functions listed in Table A-8. The drive must be in maintenance mode to perform these functions. To place the drive in maintenance mode and to select a function, see Table A-8.

Attention: Maintenance functions cannot be performed concurrently with read or write operations. While in maintenance mode, the Ultrium 2 Tape Drive does not receive SCSI commands from the host.

Table A-8. Diagnostic and maintenance functions

Function Code 1 - Run SCSI or Fibre Channel Tape Drive Diagnostics
Causes the tape drive to run self tests.
Attention: Insert only a scratch data cartridge for this test. Data on the cartridge will be overwritten.
<ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 1 appears in the single-character display. If you cycle past 1, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, 1 flashes, the drive runs diagnostics for approximately 90 seconds, then C flashes. When C flashes, the drive is waiting for a cartridge.5. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, 1 flashes:<ul style="list-style-type: none">• If the diagnostic completes successfully, it begins again and runs for a maximum of 10 times. Each loop takes approximately 20 minutes to run. After the tenth loop, the diagnostic stops and automatically exits maintenance mode. To halt the diagnostic, press the unload button within the first 20 minutes of the test (or the diagnostic will run another 20 minutes). The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The diagnostic continues to the end of its loop and then stops. The tape drive then displays 0, rewinds and unloads the cartridge, and exits maintenance mode.• If the diagnostics fail, the status light flashes amber and an error code displays. The tape drive unloads the tape cartridge and exits maintenance mode. To resolve the error, locate the code in Table 6-4 on page 6-25.

Table A-8. Diagnostic and maintenance functions (continued)

<p>Function Code 2 - Update Tape Drive Firmware from FMR Tape</p> <p>Causes the tape drive to load updated firmware from a field microcode replacement (FMR) tape.</p> <p>Attention: Do not power-off the tape drive while loading code.</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 2 appears in the single-character display. If you cycle past 2, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR tape cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, 2 flashes and the tape drive loads the updated firmware from the FMR tape cartridge into its erasable programmable read-only memory (EPROM) area:<ul style="list-style-type: none">• If the update completes successfully, the tape drive displays 0, rewinds and unloads the FMR tape, resets itself, and is ready to use the new firmware.• If the update fails, the tape drive posts an error code to the single-character display (to resolve the error, see Table 6-4 on page 6-25). The drive then unloads the FMR tape and exits maintenance mode.
<p>Function Code 3 - Create FMR Tape</p> <p>Causes the tape drive to copy its field microcode replacement (FMR) data to a scratch data cartridge.</p> <p>Attention: If you select this function, the tape drive will overwrite existing data on the scratch data cartridge.</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 3 appears in the single-character display. If you cycle past 3, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write protected (or the tape drive exits maintenance mode). After you insert the cartridge, 3 flashes and the tape drive copies the FMR data to the scratch data cartridge:<ul style="list-style-type: none">• If the tape drive creates the FMR tape successfully, it displays 0, rewinds and unloads the new FMR tape, and exits maintenance mode.• If the tape drive fails to create the FMR tape, it displays 7, unloads the FMR tape, and exits maintenance mode.

Table A-8. Diagnostic and maintenance functions (continued)

<p>Function Code 4 - Force a Drive Dump</p> <p>Causes the tape drive to perform a collection (or <i>dump</i>) of data. (A drive dump is also known as a save of the firmware trace.) The dump (firmware trace) can only be analyzed by IBM.</p> <p>Note: When an error code displays, a red dot also displays to remind you that a dump already exists. If you perform Function Code 4, it will overwrite the dump and cause the error information to be lost.</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 4 appears in the single-character display. If you cycle past 4, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, 4 displays, followed by 0. The single-character display then goes blank, and the tape drive exits maintenance mode. <p>An illuminated red dot on the single-character display indicates that a drive dump has been created. To retrieve the dump from the drive, see Function Code 5 on page A-21.</p> <p>You can also perform this operation when the tape drive is in normal operating mode. Simply press and hold the unload button for 10 seconds.</p>
<p>Function Code 5 - Copy the Drive Dump to Tape (at Beginning of Tape)</p> <p>Causes the tape drive to copy data from a drive dump (captured with Function Code 4) to the beginning of a scratch data cartridge. An illuminated red dot on the single-character display indicates that a drive dump has been created.</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 5 appears in the single-character display. If you cycle past 5, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write-protected (or the tape drive exits maintenance mode). After you insert the cartridge, 5 flashes and the tape drive writes the dump data to the tape (at the beginning of the tape). When the function is complete, 0 displays, the drive rewinds and unloads the tape, and exits maintenance mode. <p>From the server, issue the SCSI READ command to read the dump from the tape to a file or electronic image. For information about where to send the electronic image, contact your OEM Product Application Engineer (PAE).</p>

Table A-8. Diagnostic and maintenance functions (continued)

Function Code 6 - Run SCSI or Fibre Channel Wrap Test

Causes the drive to perform one of the following:

- A check of the SCSI circuitry from and to the SCSI connector
- A check of the Fibre Channel circuitry from and to the Fibre Channel connector or fiber cable

To run the test, determine whether your drive uses a SCSI or Fibre Channel interface, then choose one of the following procedures.

Running a SCSI Wrap Test

This test evaluates the SCSI circuitry. A SCSI LVD wrap plug, the single-ended SCSI LVD terminator that was shipped with the drive, and a Y-cable are required for this procedure.

Note: You can terminate the Generation 1 drive internally while running the SCSI wrap test. Internal termination is not built into the Generation 2 drive, therefore you must run the SCSI wrap test by using a Y-cable and external termination.

Before you select this function, you must configure the drive to supply term power, terminate the SCSI bus, and attach the SCSI wrap plug. Configure the drive to supply term power by placing a jumper on pin 6 of the drive's SCSI ID connector (as shown by the shaded area in the figure below).



Connect a Y-cable to the drive's SCSI connector. Place a terminator on one end of the Y-cable and the wrap plug on the other end.

1. Ensure that the drive does not contain a cartridge.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until **6** appears in the single-character display. If you cycle past **6**, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
 - If the test is successful, it loops and begins again. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop, then stops. **0** displays and the drive exits maintenance mode. To continue to isolate the problem, go to "Fixing SCSI Bus Errors" on page A-9 and locate the steps to take after you run the SCSI wrap test.
 - If the test fails, **8** displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, replace the tape drive (see "Tape Drive Sled" on page 8-4).

Table A-8. Diagnostic and maintenance functions (continued)

Running a Fibre Channel Wrap Test

This test evaluates the Fibre Channel circuitry at the drive's Fibre Channel connector, then at the fiber cable. A Fibre Channel wrap plug is required for this procedure. To run the wrap test through the fiber cable, a duplex adapter is required.

All cables and wrap plugs are hot-pluggable (that is, they can be removed from or added to the drive while the drive or its enclosure is powered-on). Do not bend the fiber cable more than a radius of 50.8 mm (2 in.) or the optical fiber may break.

1. Take all devices on the Fibre Channel offline (for instructions, refer to your server's documentation).
2. Make sure that no cartridge is in the drive.
3. Disconnect the fiber cable from the drive and replace it with the Fibre Channel wrap plug. (When you disconnect the cable, the connection to the Fibre Channel loop may break, but will be restored at the end of the procedure when you reconnect the cable. For other devices on the loop, operations may temporarily be disrupted.)

Attention: Do not run the wrap test while the drive is connected to a Fibre Channel loop. This could disturb the Fibre Channel loop and cause performance or I/O problems.

4. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
Note: If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.
5. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.
Note: If you cycle past **6**, press the unload button once per second until it redisplay.

Testing the Circuitry at the Drive's Fibre Channel Connector

6. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
 - If the test is successful, the circuitry at the drive's Fibre Channel connector is working properly. The test loops and begins again. Press the unload button. **0** displays and the tape drive exits maintenance mode. Continue to step 7 to test the fiber cable.
 - If the test fails, an error code displays and the status light flashes amber. The test stops and the drive exits maintenance mode. To resolve the error, locate the code in Table 6-4 on page 6-25.
7. Disconnect the Fibre Channel wrap plug from the drive.

Testing the Circuitry at the Fiber Cable

8. Connect the duplex adapter, then the Fibre Channel wrap plug to the end of the fiber cable.
Note: The Fibre Channel wrap test can only be run on cable lengths up to 250 meters (820 ft).
9. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
Note: If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.
10. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.
Note: If you cycle past **6**, press the unload button once per second until it redisplay.
11. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
 - If the test is successful, the drive and the cable are working properly. The problem is at the server. To resolve the error, refer to the service guide for the server.
 - If the test fails, replace the fiber cable.
12. Remove the Fibre Channel wrap plug and the duplex adapter, and reconnect the fiber cable.

Table A-8. Diagnostic and maintenance functions (continued)

<p>Function Code 7 - Run LDI or RS-422 Wrap Test</p> <p>Causes the tape drive to perform a check of the circuitry from and to the LDI or RS-422 connector.</p> <p>Before you select this function, attach an LDI or RS-422 wrap plug to the tape drive's LDI or RS-422 connector (in place of the LDI or RS-422 cable).</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 7 appears in the single-character display. If you cycle past 7, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, 7 flashes and the tape drive automatically starts the test:<ul style="list-style-type: none">• If the test is successful, it loops and begins again. To halt the test, press the unload button. The test continues to the end of its loop and then stops. The tape drive then displays 0 and exits maintenance mode.• If the test fails, 9 displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, locate 9 in Table 6-4 on page 6-25.
<p>Function Code 8 - Convert FMR Tape to Scratch Tape</p> <p>Causes the tape drive to erase the field microcode replacement (FMR) data on a scratch data cartridge and rewrite the cartridge memory on the tape. This turns the cartridge into a valid scratch data cartridge.</p> <ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 8 appears in the single-character display. If you cycle past 8, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, 8 flashes, the tape drive erases the firmware on the tape, then rewrites the header in the cartridge memory to change the cartridge to a valid scratch data cartridge:<ul style="list-style-type: none">• If the operation is successful, the tape drive displays 0, rewinds and ejects the newly converted scratch data cartridge, and exits maintenance mode.• If the operation is not successful, an error code displays. To resolve the error, locate the code in Table 6-4 on page 6-25.

Table A-8. Diagnostic and maintenance functions (continued)

Function Code 9 - Display Error Code Log
Causes the tape drive to display the last 10 error codes, one at a time (the codes are ordered; the most recent is presented first and the oldest (tenth) is presented last).
<ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until 9 appears in the single-character display. If you cycle past 9, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, press the unload button to view the most recent error code. Press the unload button again to view successive error codes. If you press the unload button for 3 seconds after the tenth error code displays, 0 displays (if there are no errors in the log) and the drive exits maintenance mode.
Function Code A - Clear Error Code Log
Causes the tape drive to erase the contents of the error code log.
<ol style="list-style-type: none">1. Make sure that no cartridge is in the drive.2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.3. Press the unload button once per 1.5 seconds until A appears in the single-character display. If you cycle past A, continue to press the unload button until it redisplay.4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive erases all errors from the error code log, displays 0, then exits maintenance mode.
Function Code C - Insert Cartridge into Tape Drive
This function cannot be selected by itself. It relates to other maintenance functions (such as Run Tape Drive Diagnostics or Create FMR Tape) that require an FMR tape cartridge or scratch tape cartridge that is not write protected.

Table A-8. Diagnostic and maintenance functions (continued)

<p>Function Code E - Test Cartridge & Media</p> <p>Causes the tape drive to perform a Write/Read test (on the edge bands) to ensure that a suspect cartridge and its magnetic tape are acceptable. The tape drive takes approximately 10 minutes to run the test.</p> <p>Attention: Data on the suspect tape will be overwritten.</p> <ol style="list-style-type: none"> 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Press the unload button once per 1.5 seconds until E appears in the single-character display. If you cycle past E, continue to press the unload button until it redisplay. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, E flashes and the test begins: <ul style="list-style-type: none"> • If no error is detected, the test begins again and runs for a maximum of 10 times. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays 0, and exits maintenance mode. • If an error is detected, the tape drive displays 7, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate 7 in Table 6-4 on page 6-25.
<p>Function Code F - Fast Read/Write Test</p> <p>Causes the tape drive to perform tests to ensure that the drive can read from and write to tape. This diagnostic performs fewer tests than the Run Tape Drive Diagnostics test (Function Code 1). The tape drive takes approximately three minutes to run the test. The Fast Read/Write Test is not as comprehensive a test and is not recommended for isolating errors between the drive and the media.</p> <p>Attention: Data on the suspect tape will be overwritten.</p> <ol style="list-style-type: none"> 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Press the unload button once per 1.5 seconds until F appears in the single-character display. If you cycle past F, continue to press the unload button until it redisplay. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, F flashes and the test begins. <ul style="list-style-type: none"> • If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 3 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays 0, and exits maintenance mode. • If an error is detected, the tape drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate the code in Table 6-4 on page 6-25.

Table A-8. Diagnostic and maintenance functions (continued)

<p>Function Code H - Test Head</p> <p>Causes the tape drive to perform the Head Resistance Measurements test and a Write/Read test (on the center of the tape). The drive runs these tests to ensure that the tape drive's head and tape-carriage mechanics are working correctly. The tape drive takes approximately 10 minutes to run the test.</p> <ol style="list-style-type: none"> 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Press the unload button once per 1.5 seconds until H appears in the single-character display. If you cycle past H, continue to press the unload button until it redisplay. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, H flashes and the test begins: <ul style="list-style-type: none"> • If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 10 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays 0, and exits maintenance mode. • If an error is detected, the tape drive displays 5, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate 5 in Table 6-4 on page 6-25.
<p>Function Code L - Reserved for Future Use</p> <p>Reserved for future use.</p>
<p>Function Code P or U - Enable or Disable Post Error Reporting</p> <p>Used by support personnel during error detection, this function is an alternate method of setting or preventing the post error (PER) bit in the SCSI Read-Write Error Recovery Page. For more information, refer to the MODE SENSE command in the <i>IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference</i>.</p> <ol style="list-style-type: none"> 1. Make sure that no cartridge is in the drive. 2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode. 3. Perform one of the following: <ul style="list-style-type: none"> • To enable post error reporting, press the unload button once per 1.5 seconds until U appears in the single-character display. If you cycle past U, continue to press the unload button until it redisplay. • To disable post error reporting, press the unload button once per 1.5 seconds until P appears in the single-character display. If you cycle past P, continue to press the unload button until it redisplay. 4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the drive displays one of the following: <ul style="list-style-type: none"> • P to indicate that post error reporting is enabled. • U to indicate that post error reporting is disabled.

Exiting Maintenance Mode

To manually exit maintenance mode, press the unload button once per second until **0** appears on the single-character display. Press and hold the unload button for 3 seconds. The drive exits maintenance mode (the solid amber status light turns off).

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 A-4 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)

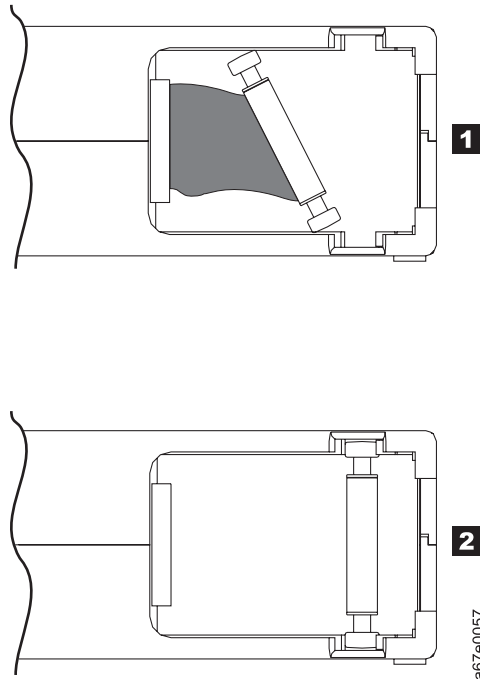


Figure A-4. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (**1** in Figure A-5) and locate the leader pin (**2**) (you may need to shake the cartridge gently to roll the pin toward the door).
2. With plastic or blunt-end tweezers, grasp the leader pin and position it in the pin-retaining spring clips (**3**).
3. Press the leader pin gently into the clips until it snaps into place and is firmly seated. Ensure that there are no gaps in the seam of the cartridge (**4**).

Attention: If gaps exist, do not continue with this procedure and do not use the cartridge. Instead, contact your OEM Product Application Engineer (PAE).

4. Close the cartridge door.

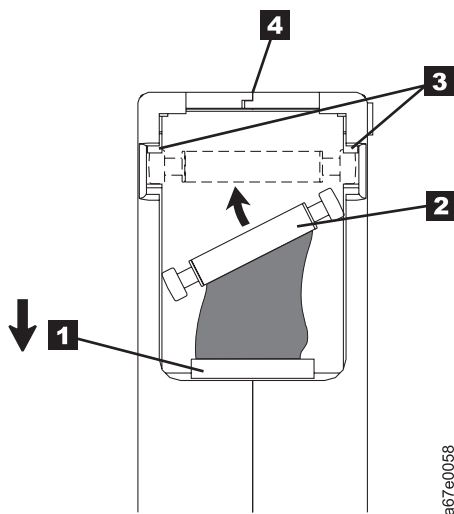


Figure A-5. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (**1** in Figure A-6) into the cartridge's hub (**2**) and turn it clockwise until the tape becomes taut.

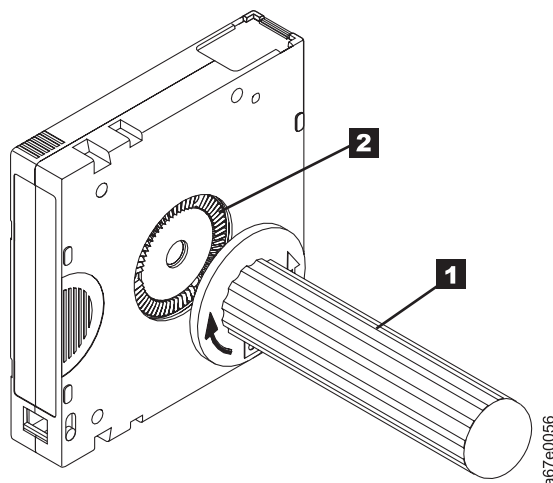


Figure A-6. Rewinding the tape into the cartridge

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

Reattaching a Leader Pin

The first meter of tape in a cartridge is leader tape. Once the leader tape has been removed there is a possibility of tape breakage. After reattaching the leader pin, transfer data from the defective tape cartridge. **Do not reuse the defective tape cartridge.**

The Leader Pin Reattachment Kit contains three parts:

- **Leader pin attach tool** (see **1** in Figure A-7). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure A-7). 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 A-7). 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.

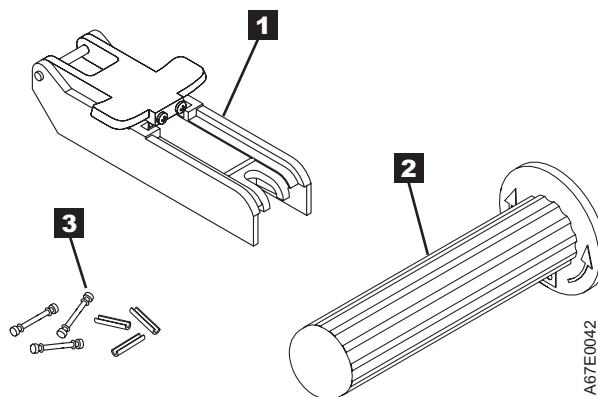
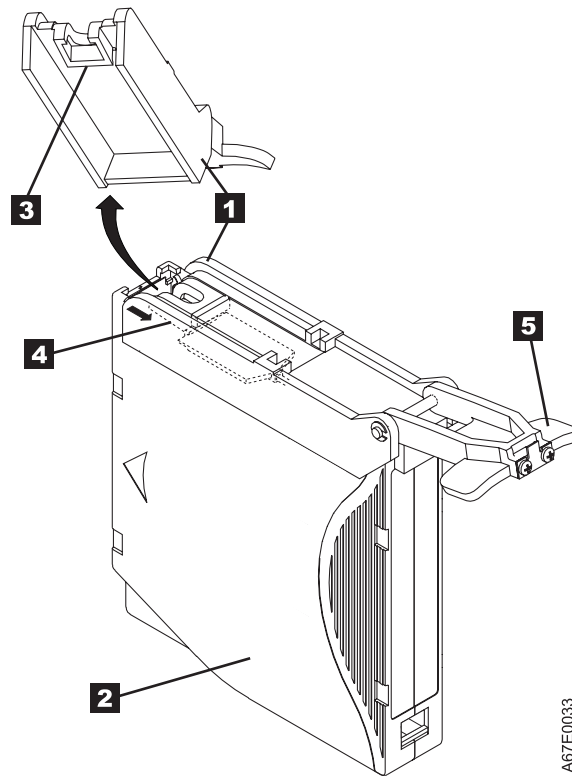


Figure A-7. Leader Pin Reattachment Kit

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 A-8) 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**).



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Figure A-8. 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 A-9) 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 12.7 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.
4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.

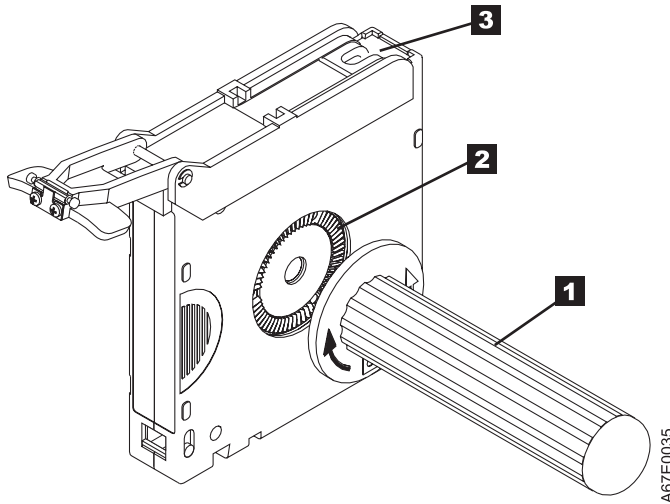


Figure A-9. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (**1** in Figure A-10), 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.

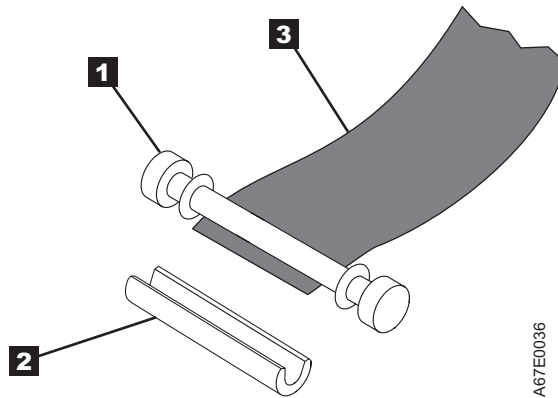


Figure A-10. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure A-11).
8. Place a new C-clip into the retention groove **2** (Figure A-11) 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 A-32) into the cavity **3** (Figure A-11) 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 A-11).

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.

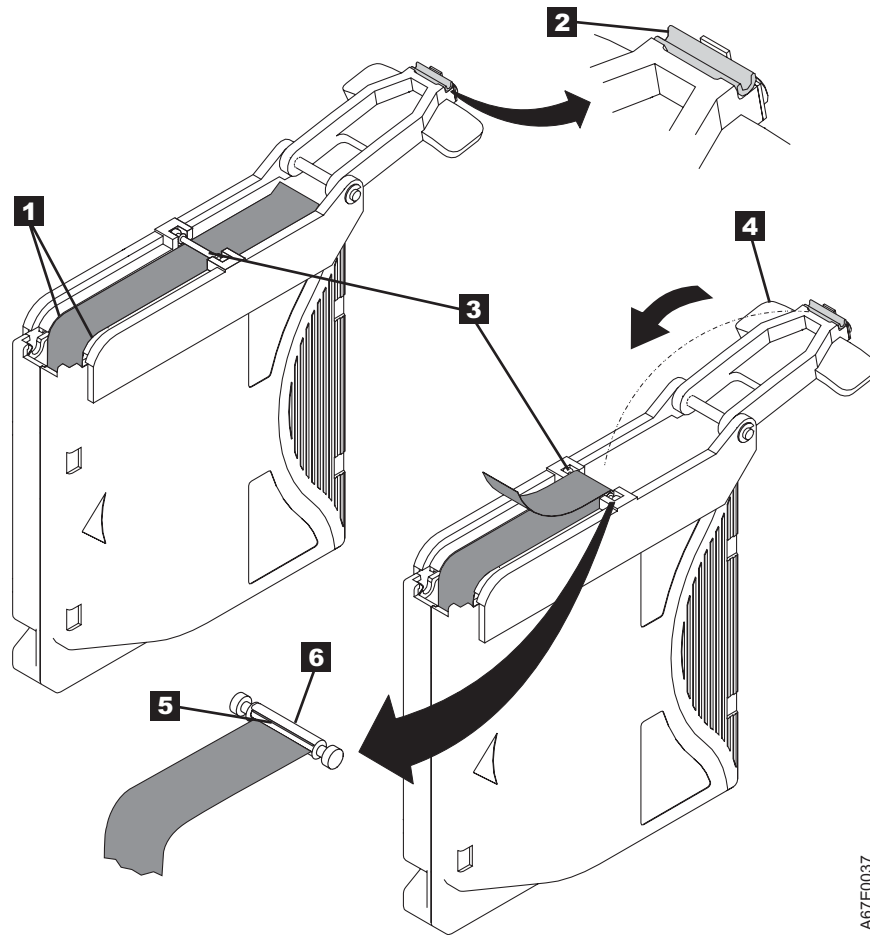


Figure A-11. Attaching the leader pin to the tape

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.

Removing a Tape Cartridge

If a tape cartridge fails to eject from the Ultrium Tape Drive 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.

Visit the web at <http://www-1.ibm.com/servers/storage/support/ltc/3580.html> and under **Learn** click on *LTO Cartridge removal for Ultrium 1 and Ultrium 2 Tape Drives* and watch a video of the procedure.

Note: Before removing the tape drive sled, preserve the drive dump. For instructions, see “Performing a Preserve Dump” on page 4-36.

Resetting the Drive and Ejecting the Cartridge

If a tape cartridge fails to eject from the Ultrium Tape Drive, 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. Open the library front door.
3. Locate the drive that contains the stuck tape cartridge. If the picker (**1** in Figure B-1 on page B-2) is in front of the drive **2**, gently lift and hold the picker out of the way.
4. Press and release the eject button **5** 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 **5** for at least 10 seconds. The single character display **3** 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).

Note: If you raised the picker to access the tape drive, lower the picker before cycling power to the library.

6. After a reset or power cycle, the drive should start a slow rewind. During the slow rewind the activity LED **4** 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 **5** 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.

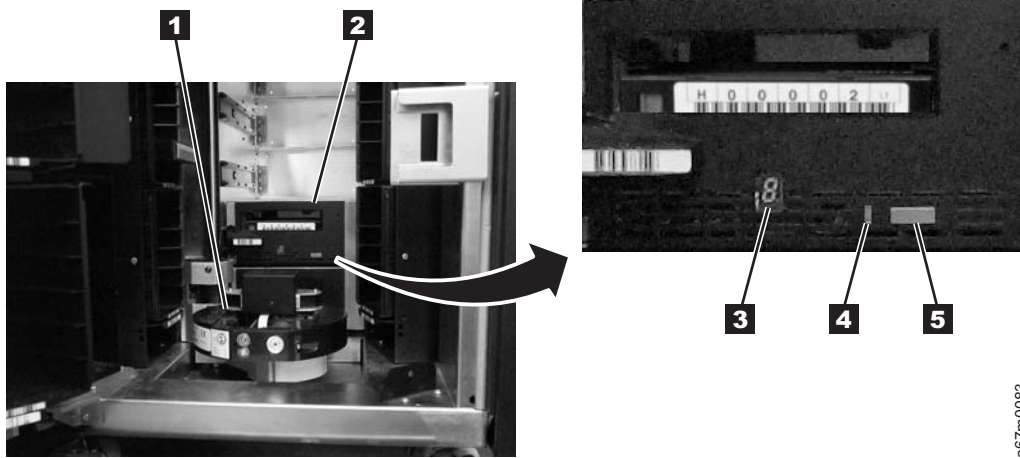


Figure B-1. Resetting the Tape Drive

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 → Status Menu → Logs → Drive Log → Options
→ Preserve Dump**

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 B-2 on page B-4) 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.

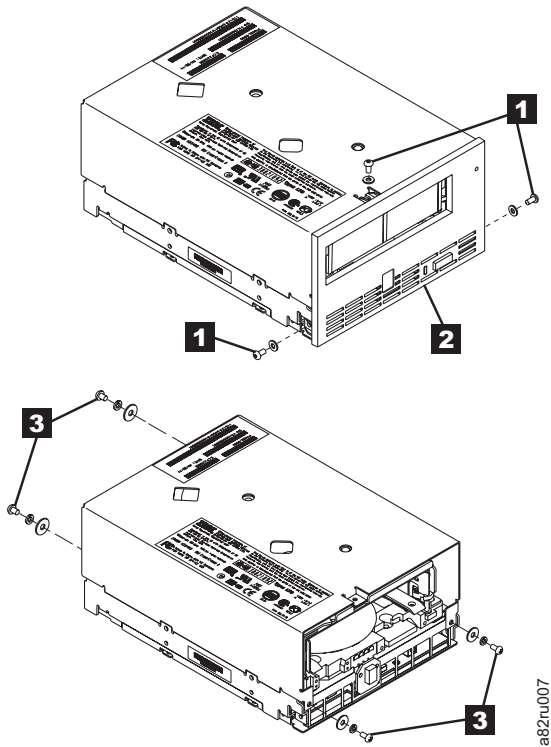


Figure B-2. Removing the cover from the internal drive

- | __ 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.

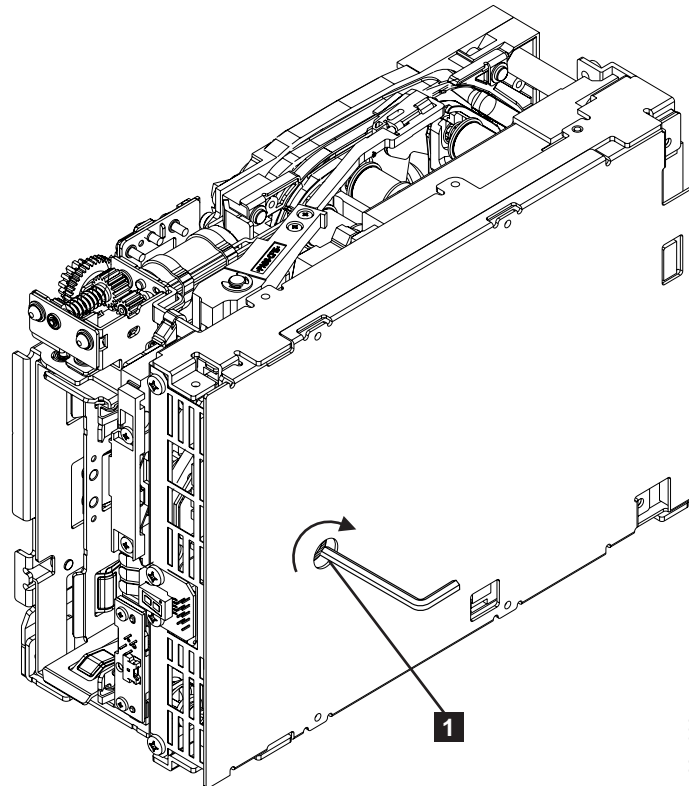
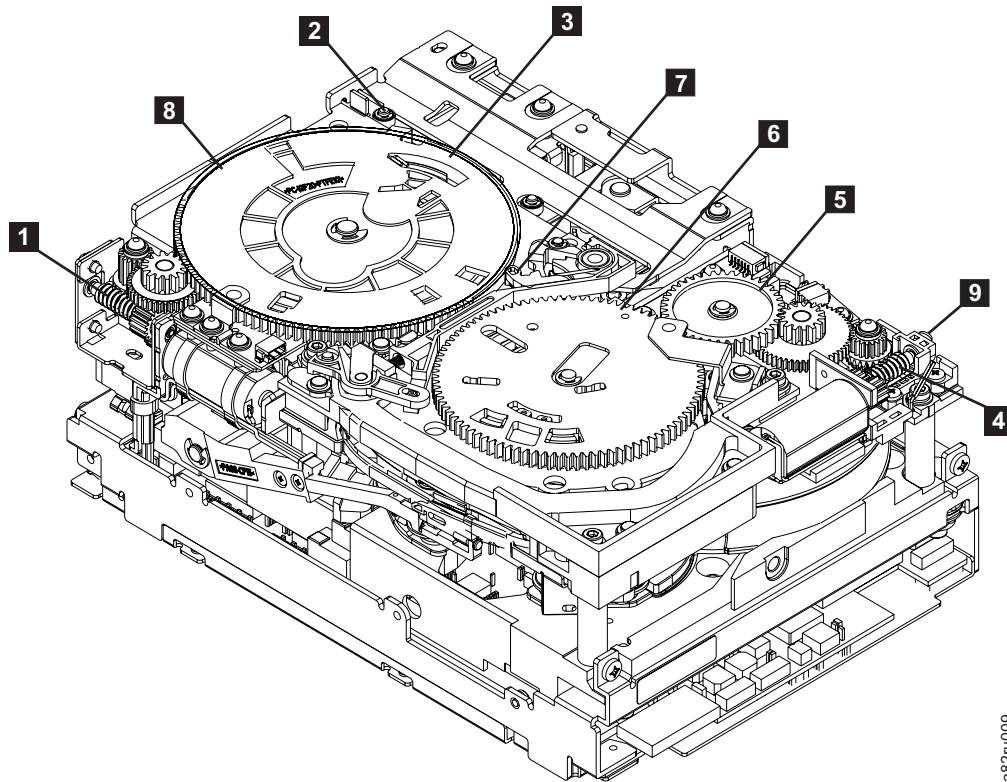


Figure B-3. Using hex wrench to rewind tape into cartridge

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 B-3.
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 "Running Drive Diagnostics" on page 4-103) to determine if it should be replaced.

Tape Pulled from or Broken near Leader Pin



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Figure B-4. 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 B-8.

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 B-4) 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 B-4) clockwise; or
 - b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure B-4) clockwise.

This rotates the threader motor worm gear (**4** in Figure B-4) 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 B-4) 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 B-16 on page B-21.

5. Notice the following:
 - a. Loader mechanism gear (**8** in Figure B-4 on page B-7) nearest the front of the drive that actuates the cartridge loader mechanism
 - b. Position of the rotator stub (**3** in Figure B-4 on page B-7).
 - c. Front loader motor worm gear (**1** in Figure B-4 on page B-7). Rotating this gear allows the loader mechanism gear (**8** in Figure B-4 on page B-7) to turn.
6. Rotate the loader motor worm gear (**1** in Figure B-4 on page B-7) to turn the loader mechanism gear (**8** in Figure B-4 on page B-7) counterclockwise. Continue turning until the rotator stub (**3** in Figure B-4 on page B-7) loses contact with the lever (**7** in Figure B-4 on page B-7). This releases the LBA leader pin.
7. Rotate the threader motor worm gear (**4** in Figure B-4 on page B-7) to turn the threader mechanism gear (**6** in Figure B-4 on page B-7) 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 B-5).

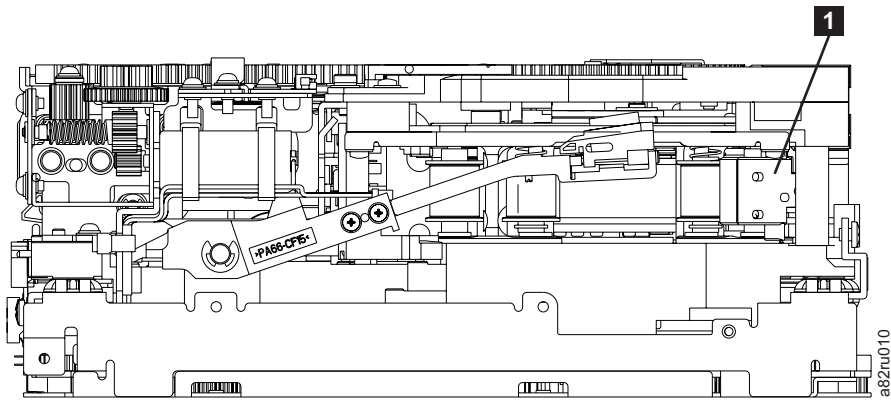


Figure B-5. Leader Block Assembly (LBA)

8. Continue rotating the loader motor worm gear (**1** in Figure B-4 on page B-7) until the rotator stub (**3** in Figure B-4 on page B-7) is positioned as shown. Notice that the rotator stub (**3** in Figure B-4 on page B-7) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure B-4 on page B-7).
9. Remove the cartridge from the cartridge loader tray.
10. Reassemble the drive by reversing the procedure in Step 4 on page B-3 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 B-7.

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 B-6) 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.
|

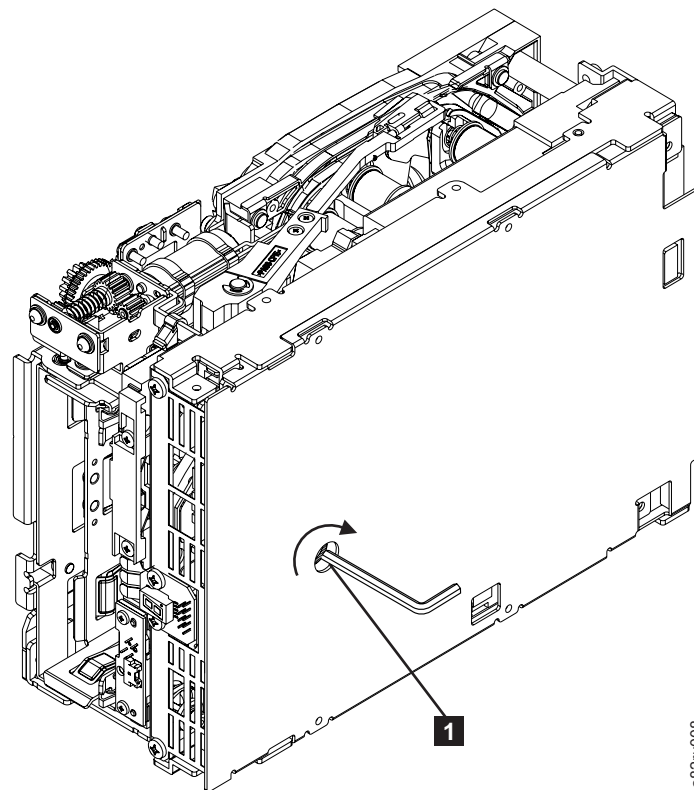


Figure B-6. Using hex wrench to rewind tape into cartridge

- | ___ 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 B-3 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 “Running Drive Diagnostics” on page 4-103) 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 B-6
- | • “Tape Pulled from or Broken near Leader Pin” on page B-7

| **--OR--**

| “Tape Broken in Mid-tape” on page B-8

- | ___ 2. Set the drive on its left side with the head and tape path facing up.
|

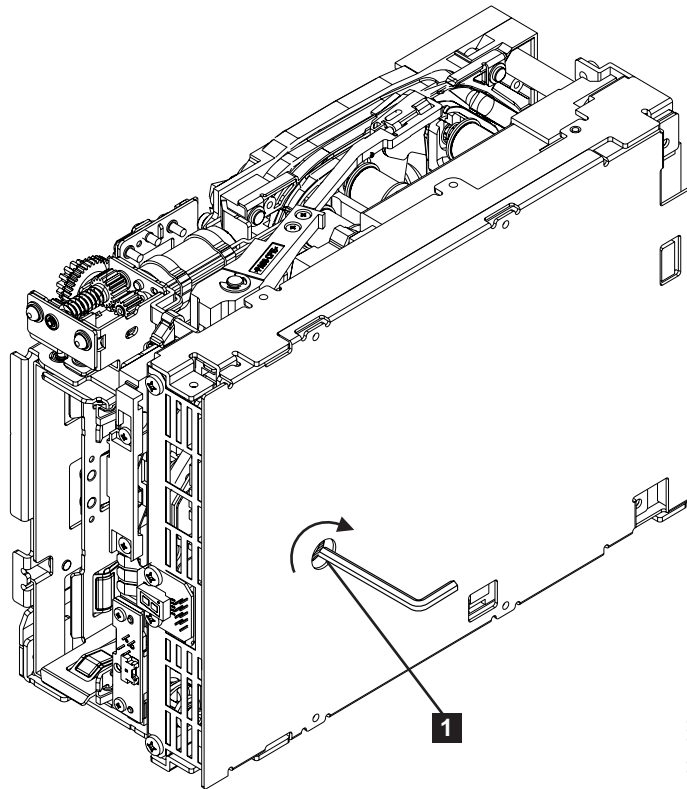
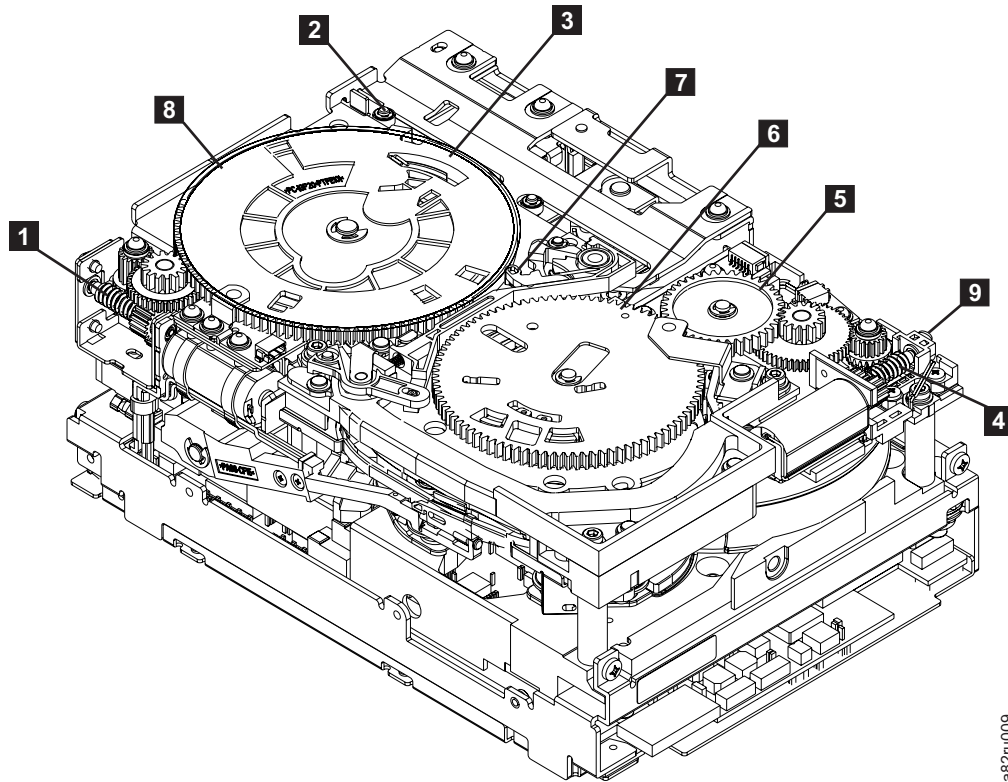


Figure B-7. Using hex wrench to rewind tape into cartridge

- | ___ 3. From the bottom of the drive, locate the access hole (**1** in Figure B-7).
 - | ___ 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 B-8 on page B-11) 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 B-8 on page B-11) clockwise; OR
 - | b. Use a #1 flathead screwdriver to turn the worm gear (**9** in Figure B-8 on page B-11) clockwise.
- | This rotates the threader motor worm gear (**4** in Figure B-8 on page B-11) clockwise, drawing the LBA into the cartridge.



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Figure B-8. 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 B-8) 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 B-7 on page B-10.

___ 8. Notice the:

- a. Loader mechanism gear (**8** in Figure B-8) nearest the front of the drive that actuates the cartridge loader mechanism.
- b. Position of the rotate stub (**3** in Figure B-8).
- c. Front loader motor worm gear (**1** in Figure B-8). Rotating this gear allows the loader mechanism gear (**8** in Figure B-8) to turn.

___ 9. Rotate the loader motor worm gear (**1** in Figure B-8) to turn the threader mechanism gear (**6** in Figure B-8) counterclockwise. Continue turning until the rotator stub (**3** in Figure B-8) loses contact with the lever (**7** in Figure B-8). This releases the LBA leader pin.

___ 10. Rotate the threader motor worm gear (**4** in Figure B-8) to turn the threader mechanism gear (**6** in Figure B-8) 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 B-9.
|

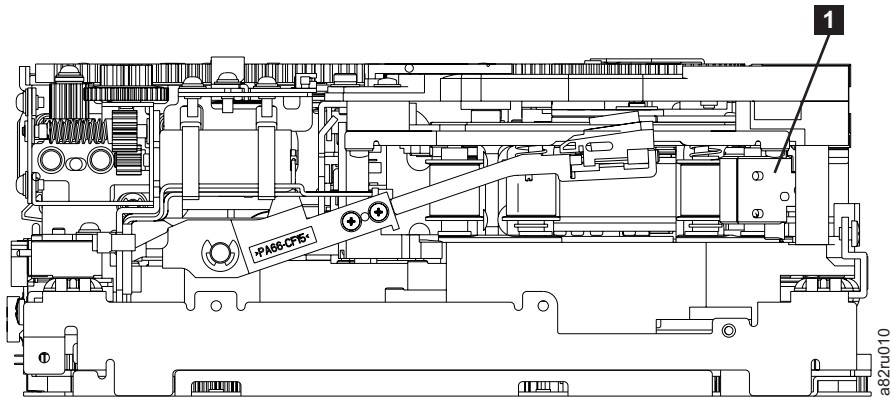
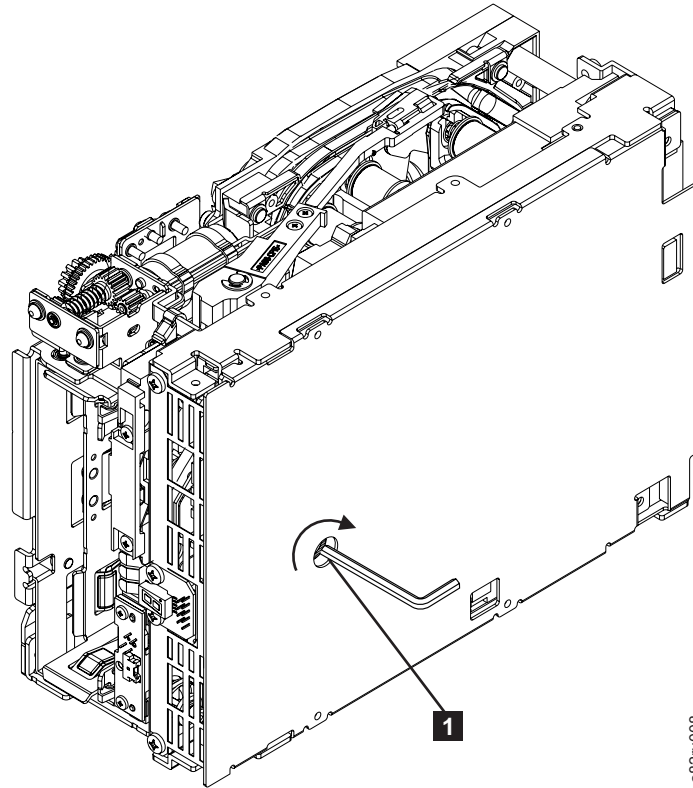


Figure B-9. Leader Block Assembly (LBA)

- | __ 11. Continue rotating the loader motor worm gear (**1** in Figure B-8 on page B-11) until the rotator stub (**3** in Figure B-8 on page B-11) is positioned as shown. Notice that the rotator stub (**3** in Figure B-8 on page B-11) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure B-8 on page B-11).
- | __ 12. Remove the cartridge from the cartridge loader tray.
- | __ 13. Reassemble the drive by reversing the procedure in Step 4 on page B-3 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.



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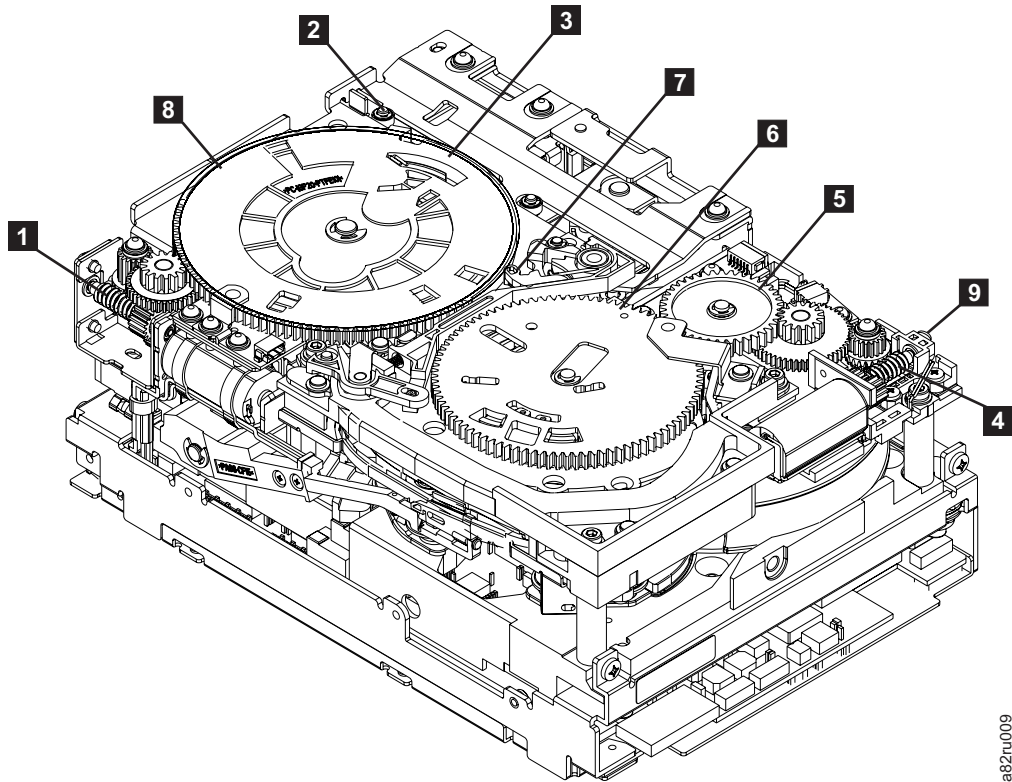
Figure B-10. Using hex wrench to rewind tape into cartridge

2. From the bottom of the drive, locate the access hole (**1** in Figure B-10).
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 B-11 on page B-14) 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 B-11 on page B-14) clockwise;

--OR--

- b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure B-11 on page B-14) clockwise.

This rotates the threader motor worm gear (**4** in Figure B-11 on page B-14) clockwise, drawing the LBA into the cartridge.



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Figure B-11. 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 B-8 on page B-11) 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 B-7 on page B-10.

7. Notice the:
- a. Loader mechanism gear (**8** in Figure B-11) nearest the front of the drive that actuates the cartridge loader mechanism.
 - b. Position of the rotate stub (**3** in Figure B-11).
 - c. Front loader motor worm gear (**1** in Figure B-11). Rotating this gear allows the loader mechanism gear (**8** in Figure B-11) to turn.
8. Rotate the loader motor worm gear (**1** in Figure B-11) to turn the threader mechanism gear (**6** in Figure B-11) counterclockwise. Continue turning until the rotator stub (**3** in Figure B-11) loses contact with the lever (**7** in Figure B-11). This releases the LBA leader pin.
9. Rotate the threader motor worm gear (**4** in Figure B-11) to turn the threader mechanism gear (**6** in Figure B-11) 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 B-12.
|

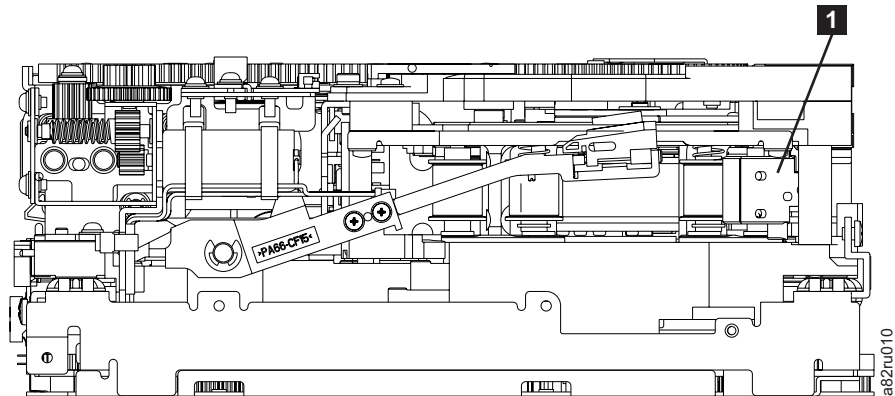


Figure B-12. Leader Block Assembly (LBA)

- | __ 10. Continue rotating the loader motor worm gear (**1** in Figure B-11 on page B-14) until the rotator stub (**3** in Figure B-11 on page B-14) is positioned as shown. Notice that the rotator stub (**3** in Figure B-11 on page B-14) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure B-11 on page B-14).
- | __ 11. Remove the cartridge from the cartridge loader tray.
- | __ 12. Reassemble the drive by reversing the procedure in Step 4 on page B-3 in Beginning Procedure.
- | __ 13. Refer to the appropriate procedure to install the new drive and return the failed drive.

Manually Removing the Tape Cartridge from an Ultrium 2 and 1 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 tape cartridge will void your warranty.

Removing the Cartridge

If a tape cartridge fails to eject from an Ultrium Tape Drive, you can manually remove the cartridge. The following tools are required for the procedure:

- 2.5-mm allen wrench
- Small-blade screwdriver or potentiometer-setting tool
- 2-mm hex wrench
- #3 Phillips screwdriver
- Needle-nose pliers
- Flashlight (optional)



Attention: Before performing this procedure, note the following:

- Ensure that you have attempted all normal methods of removing the tape cartridge from the drive. Refer to “Resetting the Drive and Ejecting the Cartridge” on page B-1.
- This procedure may damage the stuck tape cartridge. If you use this procedure, copy the data from the stuck cartridge to another cartridge. If you choose to reuse the stuck cartridge, refer to the instructions in “Repositioning or Reattaching a Leader Pin” on page A-28. If you believe the cartridge has been damaged, replace it.
- If you use a power screwdriver to perform this procedure it could destroy the tape.
- Never touch the head or electronic components within the drive. Touching may cause contamination or damage by electrostatic discharge.

To manually remove a tape cartridge, perform the following steps:

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Prepare the Library for drive sled removal. Using the operator panel, select **More** → **Service** → **Drives** → **Repair** → **Remove**.
3. Power Off the Tape Library by setting the Main Switch on the ac Input Power Module to the O position.
4. Disconnect all cables to the drive sled that contains the stuck cartridge.
5. Loosen the two captive thumbscrews **1** on the drive sled **2** and slide the drive sled out using the handle **3** (see Figure B-13 on page B-17).

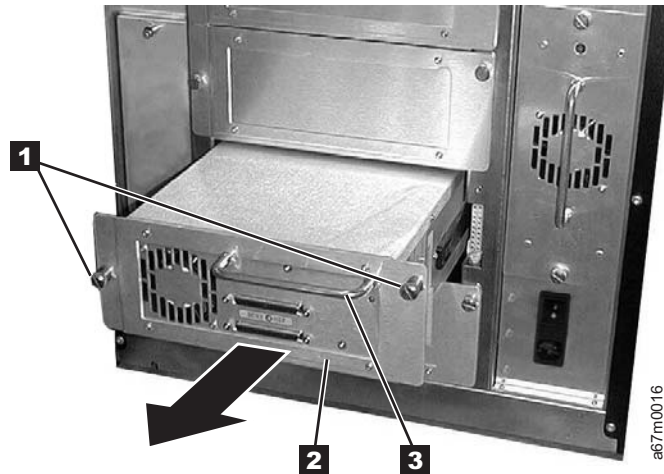


Figure B-13. Removing the Drive Sled

6. Place the drive sled so the front of the drive faces you, then tilt it on its left side (see Figure B-14).
7. Locate the access hole at the bottom of the unit **1** in Figure B-14.
8. Insert a 2.5-mm allen wrench into the access hole **1** and position the wrench so it is seated in the screw of the supply reel motor (not visible).
9. Push open the door of the tape load compartment and locate the flag **2** on the drive's takeup reel.

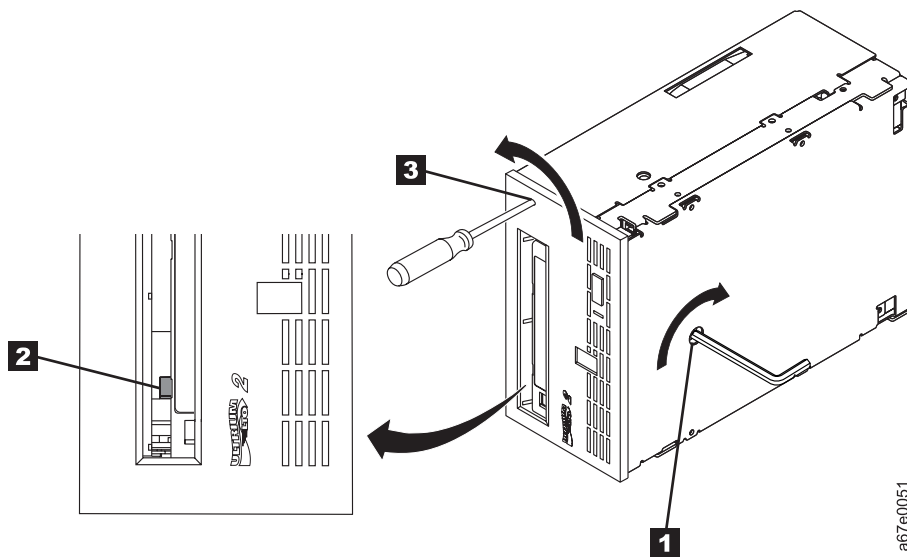


Figure B-14. Determining whether the tape is broken. The view is from the front of the drive.



Attention: In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the tape.

10. To determine whether the tape is broken, watch the flag **2** on the drive's takeup reel while you rotate the allen wrench **1** clockwise (do not let the wrench move counterclockwise):
 - If you feel resistance to the allen wrench while attempting to turn the supply reel motor screw clockwise, go to step 12 on page B-18.
 - If the takeup reel turns when you rotate the supply reel motor screw clockwise with the allen wrench, the tape is not broken. Go to step 11 on page B-18.

- 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**. 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 B-19.
11. Continue to rotate the allen wrench until you feel resistance. The tape has been rewound as far as it can go without unthreading.

Note: The number of 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.

12. With the allen wrench still inserted into the bottom access hole, insert a small-blade screwdriver or potentiometer-setting tool into the access hole for the loader motor gear **3**.
13. While keeping torque on the supply reel motor screw and rotating the allen wrench **1** clockwise, rotate the loader motor gear with the small-blade screwdriver **3** counterclockwise (see arrow). As you rotate the screwdriver, the allen wrench moves slightly.
14. With the small-blade screwdriver continue to rotate the loader motor gear in the unload direction (counterclockwise).
- If you feel no resistance to the allen wrench and the cartridge slowly moves up and out of the tape load compartment, the procedure was successful. Go to step 15.
 - If you feel resistance to the allen wrench and the cartridge does not move, the loader mechanism is jammed or the leader block is not at the home position. Remove the small-blade screwdriver and contact your IBM Service Representative to perform the procedure in “Fixing an Internal Jam” on page B-19.
15. Remove the tape cartridge. If the leader pin is not seated correctly in the cartridge, see “Repositioning or Reattaching a Leader Pin” on page A-28.
16. Copy the data on the stuck tape cartridge to another cartridge. After you remove the stuck tape cartridge, advise customer to copy the data on the tape to another tape. Then, advise the customer to discard the stuck tape cartridge.
17. Slide the drive sled into slot you removed it from using the handle **3** (see Figure B-13 on page B-17). Tighten the two captive thumbscrews **1** on the drive sled **2**.
18. Connect the SCSI cables that were disconnected in step 4 on page B-16.
19. Power On the library by setting the Main Switch on the ac Input Power Module to the I position.
20. Refer to Table A-8 on page A-19 and run the Fast Read/Write Diagnostic (Function Code F).
21. Ask customer to 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 tape cartridge will void your warranty.

Before performing this procedure, ensure that you have completed the steps that begin on page B-16. Do not attempt this procedure until you have completed these steps.

If you have reached this point, the tape is broken or the leader pin dropped (or looked 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 B-15 on page B-20) 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.

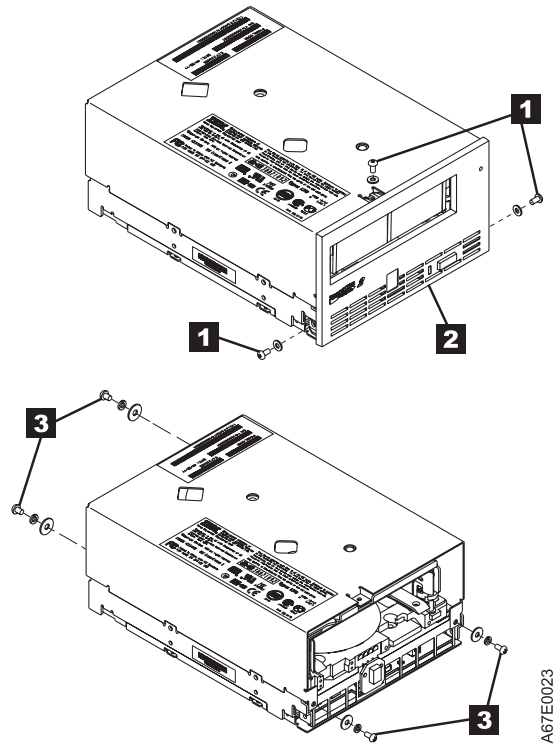


Figure B-15. Removing the top cover of the drive

3. Examine the drive to determine the cause of the problem:
 - If the tape is broken, do not attempt repair. Return the drive and the stuck tape to your reseller for maintenance (note that your tape will be scrapped).
 - If the leader pin dropped from the leader block, go to step 4 on page B-21 and continue this procedure.
 - If the leader block pulled the tape (but not the pin) from the spool so that it looks like the pin was dropped, go to step 4 on page B-21 and continue this procedure.

4. Place the tape drive so that the front faces you, then tilt it on its left side (see Figure B-16).
5. At the bottom of the drive, locate the access hole (**1** in Figure B-16).



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.

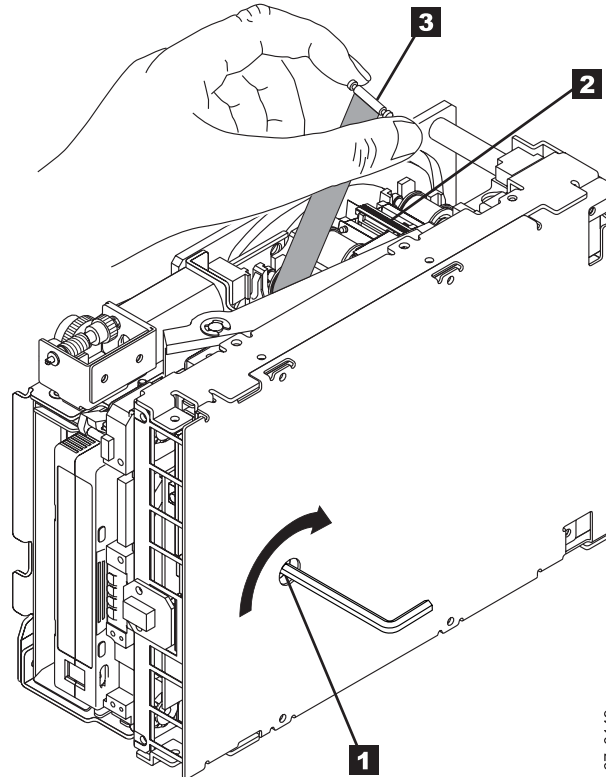


Figure B-16. Rewinding the leader pin into the tape cartridge

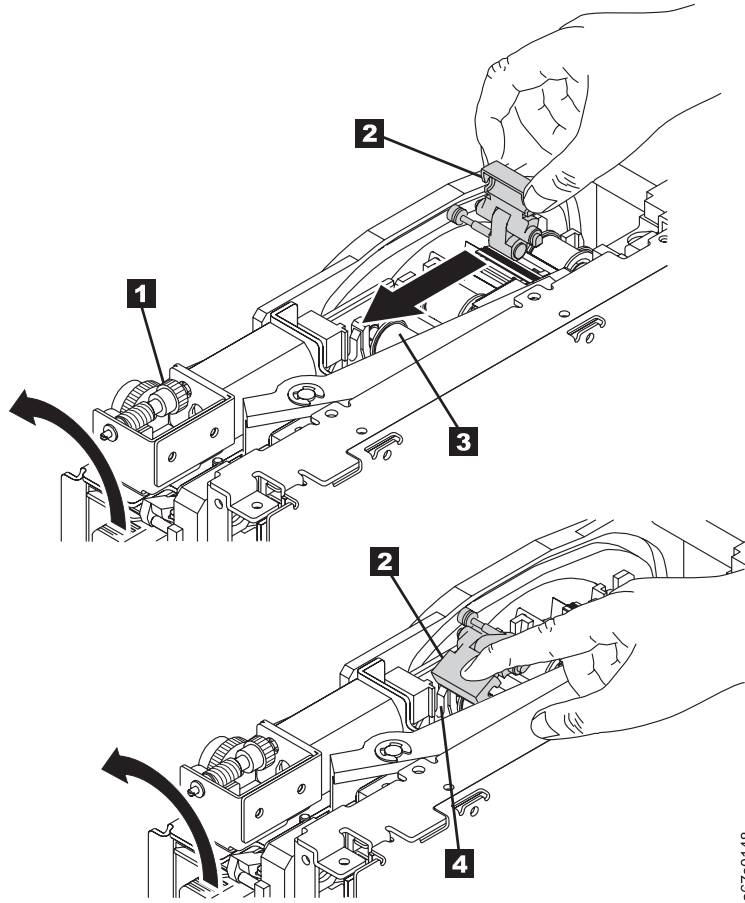
7. With clean needle-nose pliers, grasp the end of the leader pin and pull it out of the cartridge so that you can grip it with your fingers (see **3** in Figure B-16).

Note: If the leader pin is not connected to the tape, set the pin aside. After you remove the cartridge, reattach the pin (see “Repositioning or Reattaching a Leader Pin” on page A-28).

8. While keeping the tape taut with your fingers, rotate the allen wrench clockwise **1** to wind the excess tape into the cartridge. Guide the leader pin toward the cartridge and drop it inside the cartridge door. Ensure that no tape 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 B-17) 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**.



a67s0148

Figure B-17. 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 B-18).

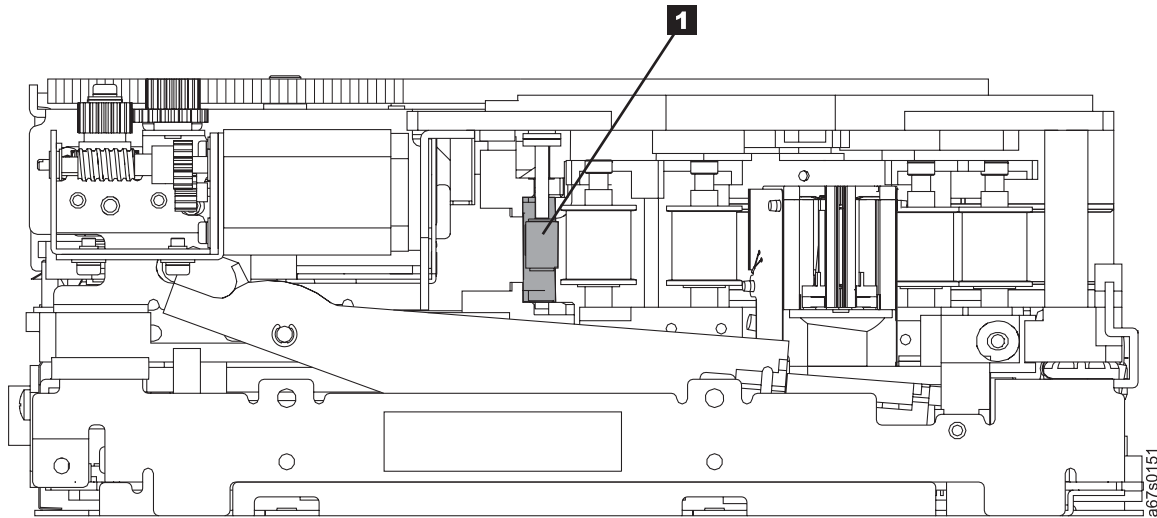


Figure B-18. Rotating the loader motor gear until the leader block is fully inside the drive. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

- Continue to rotate the loader motor gear counterclockwise. The leader block retracts and occupies the opening to the drive (see **1** in Figure B-19).

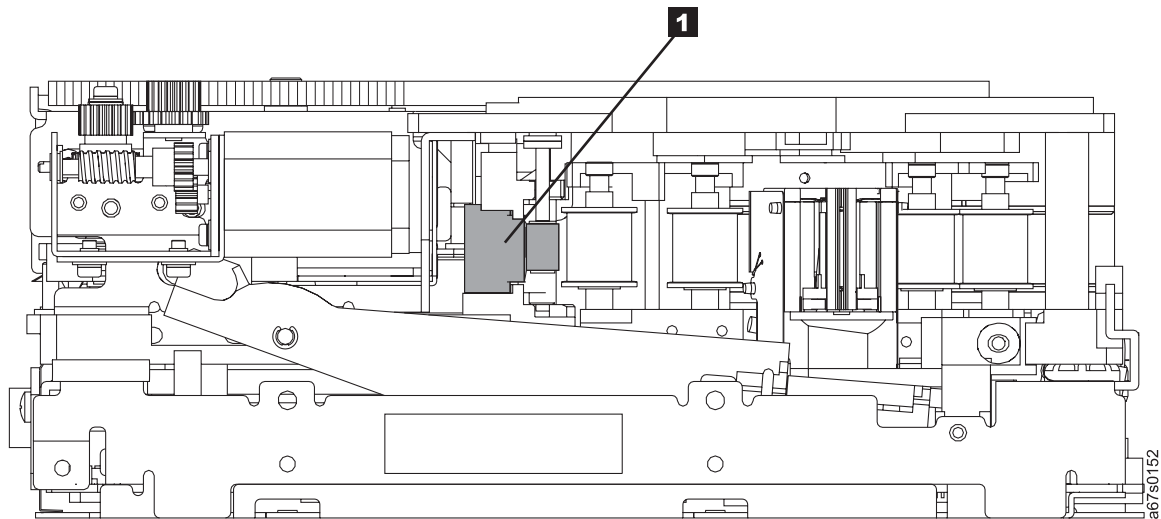


Figure B-19. Rotating the loader motor gear so that the leader block retracts. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

13. Rotate the loader motor gear counterclockwise until you feel resistance and the cartridge rises and ejects (see Figure B-20).

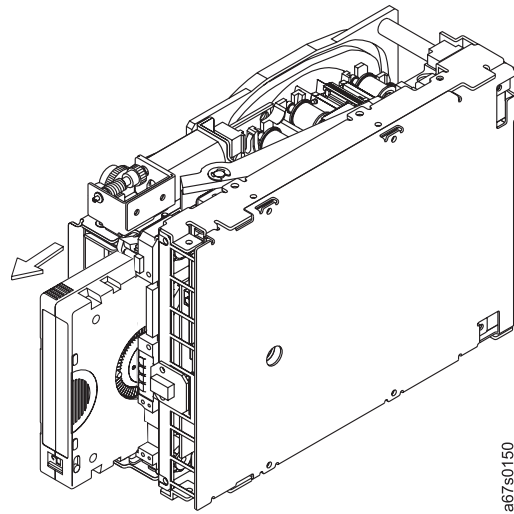


Figure B-20. Rotating the loader motor gear until the cartridge ejects

14. Remove the tape cartridge. If the leader pin is not seated correctly in the cartridge, see “Repositioning or Reattaching a Leader Pin” on page A-28.
15. Copy the data on the stuck tape cartridge to another cartridge. If appropriate, return the stuck tape cartridge for analysis in its original packaging or in the packaging from its replacement.
16. Reassemble the tape drive by reversing the preceding steps.
17. Install the new Tape Drive Sled.
18. Restore power to the tape library by setting the main power switch to I.
19. Ask the customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.
20. To ensure that the drive operates properly, refer to page A-19 and select Function Code 1 - Run Tape Drive Diagnostics.

If you need help with this procedure, contact your OEM Product Application Engineer (PAE).

Element Addressing

Note: The phrase Windows 200x in this appendix refers to both Microsoft Windows 2000 and Microsoft Windows 2003 operating systems.

All Operating Systems and Windows 200x with RSM Disabled

Element addressing in this section applies to all operating systems and Windows 200x that has the Remote Storage Manager (RSM) disabled.

Figure C-1 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.

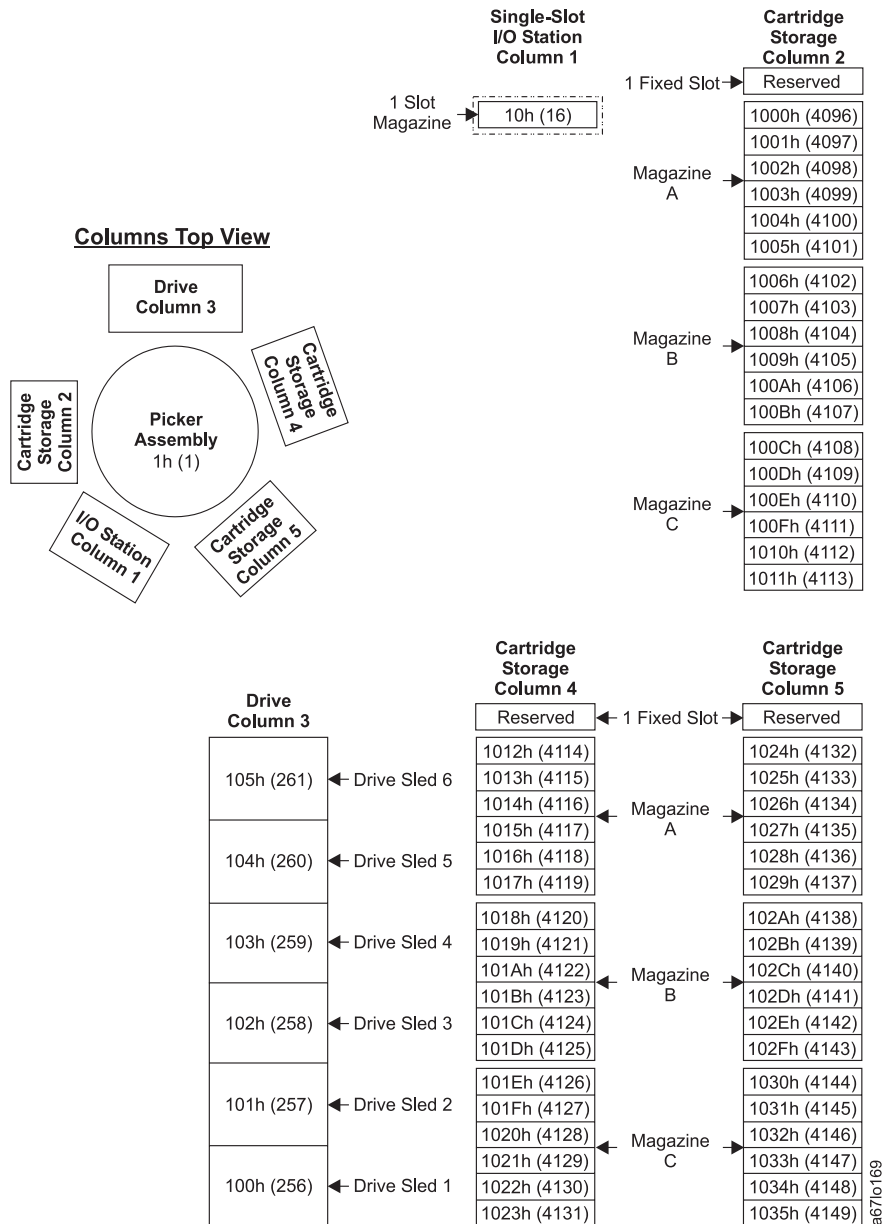


Figure C-1. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is disabled.

Figure C-2 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.

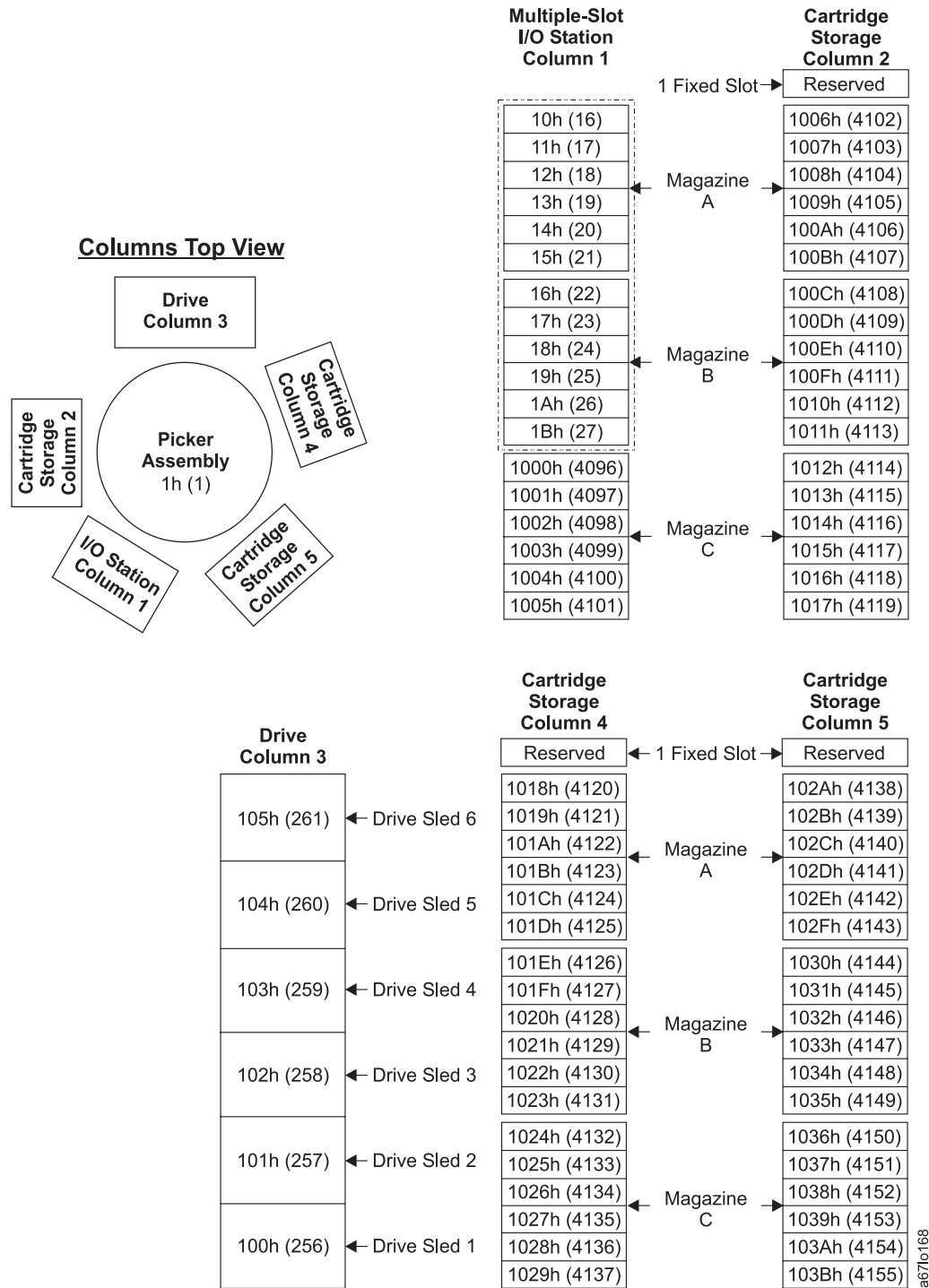


Figure C-2. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is disabled.

Figure C-3 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

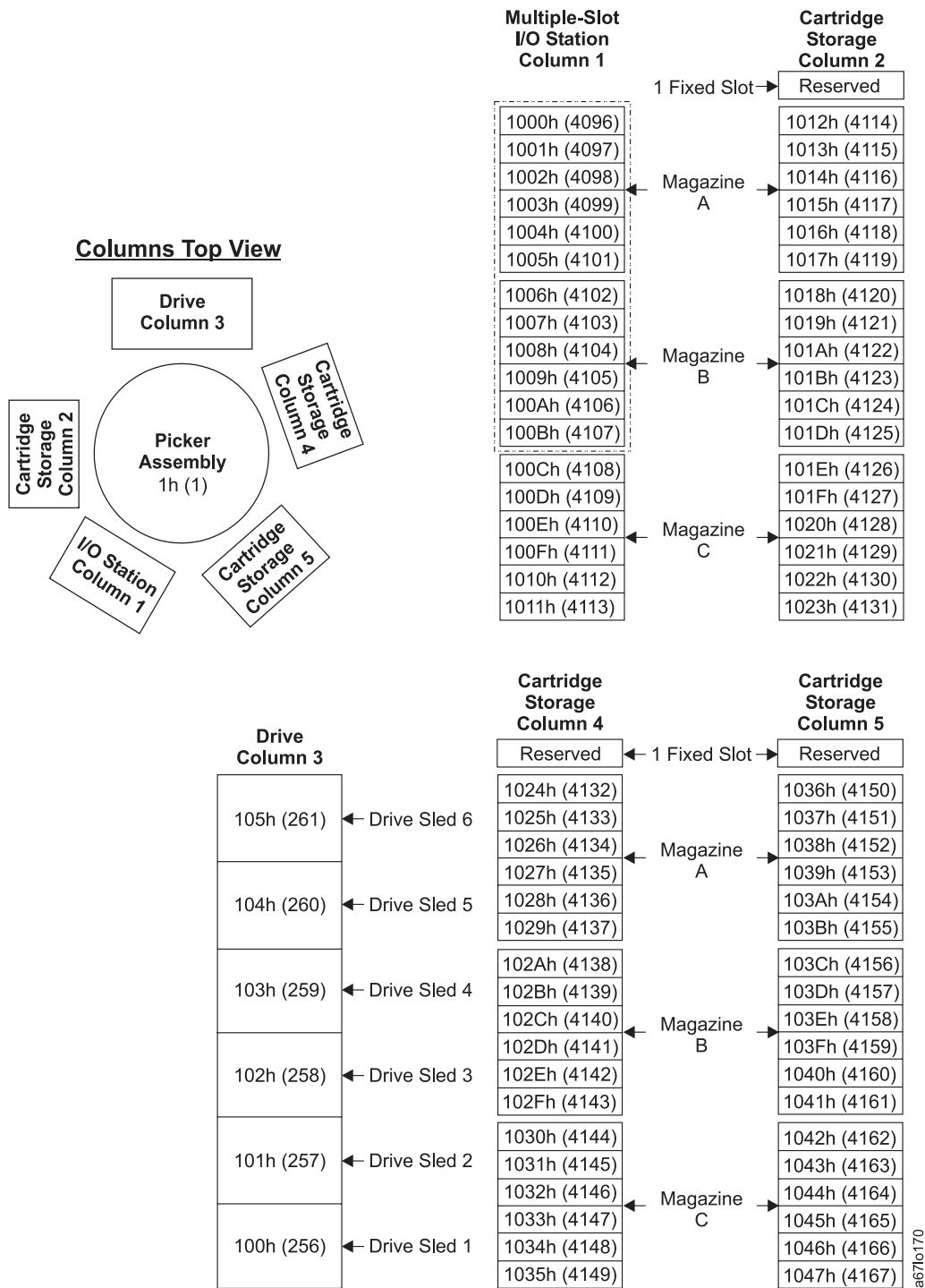


Figure C-3. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is disabled.

Windows 200x with RSM Enabled

Element addressing in this section applies to the Windows 200x operating system that has the Remote Storage Manager (RSM) enabled.

Figure C-4 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.

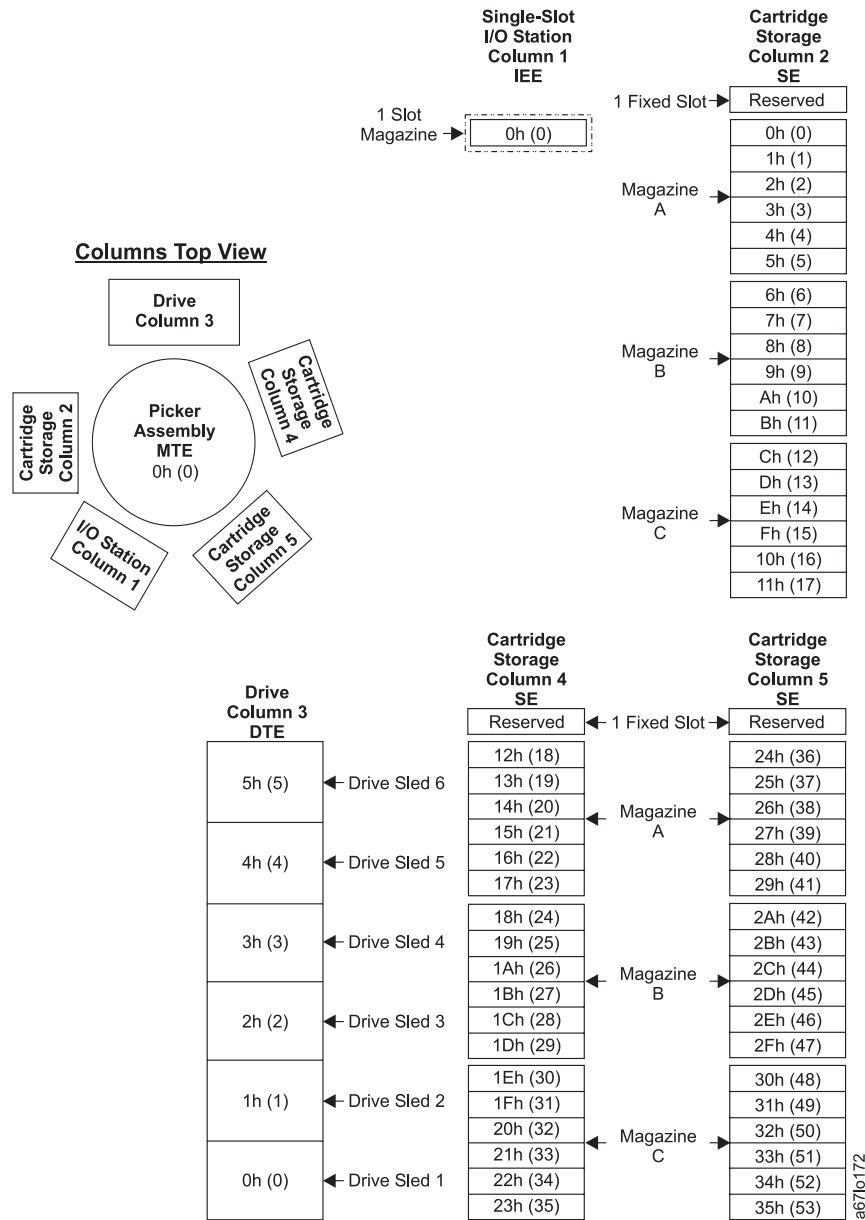


Figure C-4. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is enabled.

Figure C-5 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.

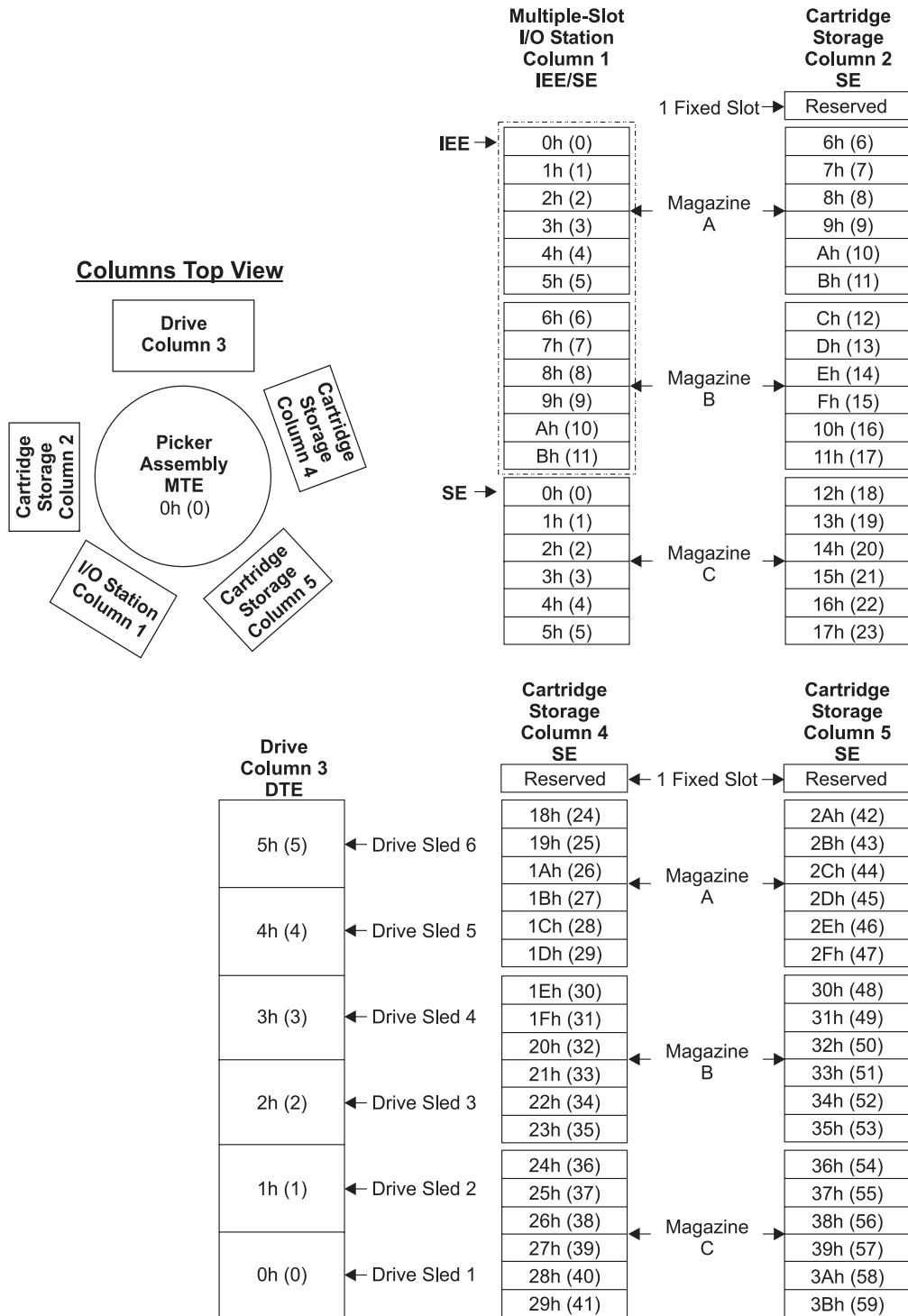


Figure C-5. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is enabled.

Figure C-6 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

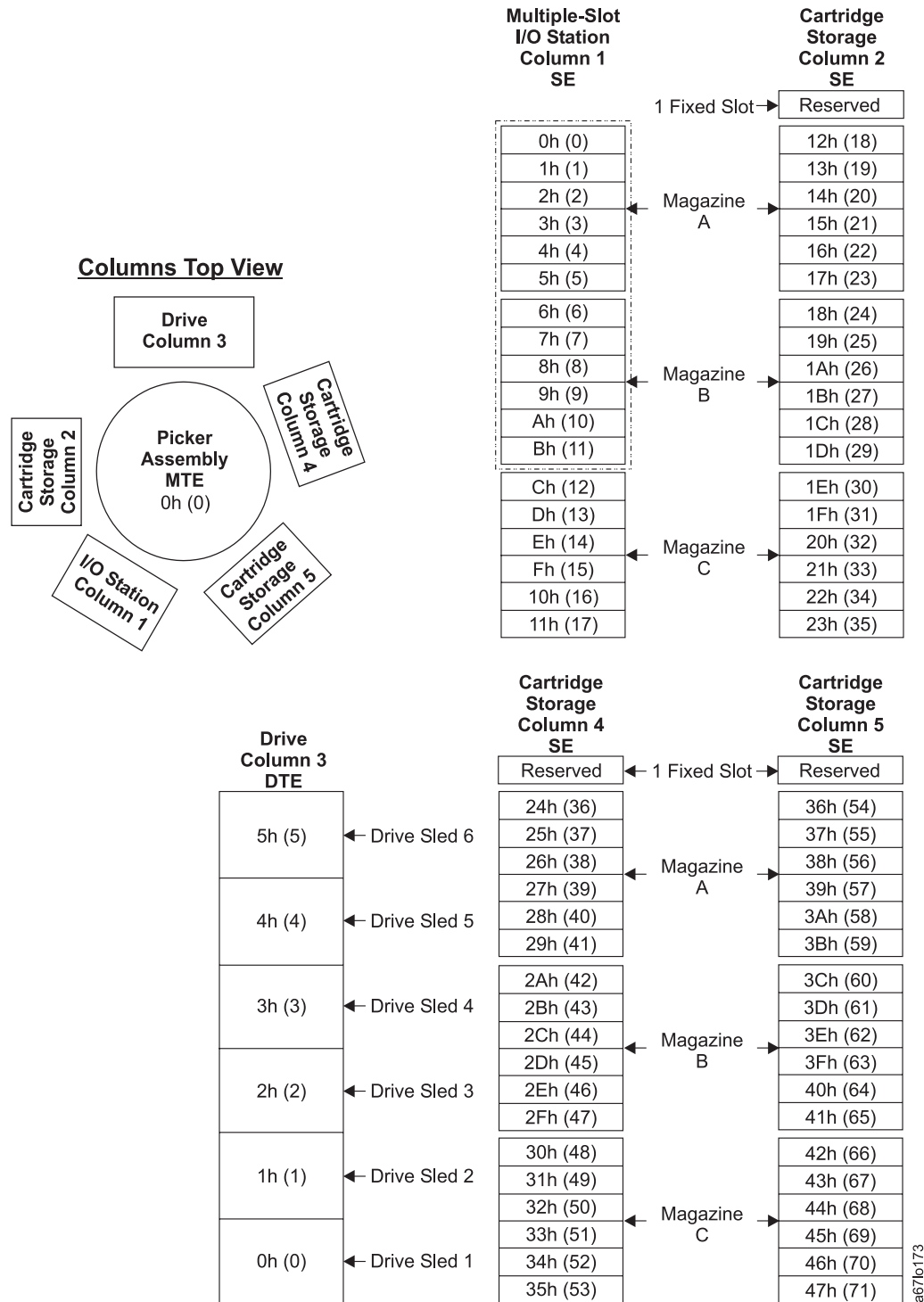


Figure C-6. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is enabled.

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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:

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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."

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Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication. If you do not find the term you are looking for, refer to the index or to the *Dictionary of Computing*, 1994.

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.

Ultrium Scalable Tape Library. A device that can be attached to a supported server and used to write data to and from magnetic tape. With its robotics, the Tape Library can process up to 72 tape cartridges each with a capacity of 100 GB and at a data transfer rate of 14.9 MB per second.

A

A. Ampere.

ac. Alternating current.

access method. A technique for moving data between main storage and input or output devices.

adapter card. A circuit board that adds function to a computer.

adj. Adjustment.

AIX. Advanced Interactive Executive. IBM's implementation of the UNIX[®] operating system. The RS/6000 system, among others, uses AIX as its operating system.

alphanumeric. Pertaining to a character set that contains letters, numerals, and usually other characters, such as punctuation marks.

alter. To change.

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.

ANSI. American National Standards Institute.

archive. To collect and store files in a designated place.

ASCII. American National Standard Code for Information Interchange. A 7 bit coded character set (8 bits including parity check) that consists of control characters and graphic characters.

assigning a device . The establishing of the relationship of a device to a running task, process, job, or program.

assignment. The naming of a specific device to perform a function.

asynchronous. Pertaining to two or more processes that do not depend upon the occurrence of specific events such as common timing signals.

attention (notice). A word for calling attention to the possibility of danger to a program, device, or system, or to data. Contrast with *caution* and *danger*.

ATTN. Attention.

AUTOCLEAN function. A choice on the Tape Library's menu that lets you specify the library to automatically clean the tape drive head with a cleaning cartridge.

B

backup. To make additional copies of documents or software for safekeeping.

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. Pertaining to the Tape Library, a slip of paper bearing a bar code and having an adhesive backing. The bar code label must be affixed to a tape cartridge to enable the library to identify the cartridge and its volume serial number.

bar code reader. In the Tape Library, a laser device specialized for scanning and reading bar codes and converting them into either the ASCII or EBCDIC digital character code.

bezel. Decorative and safety cover.

bicolored. Having two colors.

bit. Either of the digits 0 or 1 when used in the binary numbering system.

BM or bill of materials. A list of specific types and amounts of direct materials expected to be used to produce a given job or quantity of output.

browser. A client program that initiates requests to a Web server and displays the information that the server returns.

buffer . A routine or storage used to compensate for a difference in rate of flow of data or time of occurrence of events, when transferring data from one device to another.

bus . A facility for transferring data between several devices located between two end points, only one device being able to transmit at a given moment.

byte. A string consisting of a certain number of bits (usually 8) that are treated as a unit and represent a character. A fundamental data unit.

C

capacity. The amount of data that can be contained on storage media and expressed in bytes of data.

cartridge 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.

caution (notice) . A word to call attention to possible personal harm to people. Contrast with *attention* and *danger*.

CE . Customer engineer; field engineer; service representative.

centimeter (cm). One one-hundredth of a meter (0.01 m). Approximately 0.39 inch.

channel command . An instruction that directs a data channel, control unit, or device to perform an operation or set of operations.

char . Character.

CHK . Check.

cleaning cartridge. A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

command . A control signal that initiates an action or the start of a sequence of actions.

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.

concurrent . Refers to diagnostic procedures that can be run on one control unit while the rest of the subsystem remains available for customer applications.

contingent connection. A connection between a channel path and a drive caused when a unit check occurs during an I/O operation.

controller . A device that provides the interface between a system and one or more tape drives.

CP . Circuit protector.

ctrl . Control.

CU . Control unit.

D

danger (notice) . A word to call attention to possible lethal harm to people. Contrast with *attention* and *caution*.

data . Any representations such as characters or analog quantities to which meaning is or might be assigned.

data buffer . The storage buffer in the control unit. This buffer is used to increase the data transfer rate between the control unit and the channel.

data cartridge. A tape cartridge dedicated to storing data. Contrast with *cleaning cartridge*.

data check . A synchronous or asynchronous indication of a condition caused by invalid data or incorrect positioning of data.

dc . Direct current.

degauss. To make a magnetic tape nonmagnetic by means of electrical coils carrying currents that neutralize the magnetism of the tape.

degausser. A device that makes magnetic tape nonmagnetic.

degradation . A decrease in quality of output or throughput or an increase in machine error rate.

degraded . Decreased in quality of output or throughput or increased machine error rate.

deserialize . To change from serial-by-bit to parallel-by-byte.

detented . A part being held in position with a catch or lever.

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.

DIAG . Diagnostic section of maintenance information manual.

differential . See *High Voltage Differential (HVD)*.

direct access storage . A storage device in which the access time is independent of the location of the data.

download. (1) To transfer programs or data from a computer to a connected device, typically a personal computer. (2) To transfer data from a computer to a connected device, such as a workstation or microcomputer.

DRAM . Dynamic random-access memory.

drive, magnetic tape . A mechanism for moving magnetic tape and controlling its movement.

DRV . Drive.

DSE . Data security erase.

DSP . Digital signal processor.

E

EBCDIC. Extended binary-coded decimal interchange code.

EC . Edge connector. Engineering change.

ECC . Error correction code.

EEPROM . Electrically erasable programmable read-only memory.

EIA . Electronics Industries Association.

EIA unit . A unit of measure, established by the Electronic Industries Association, equal to 44.45 millimeters (1.75 inches).

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*.

EPO . Emergency power off.

EPROM . Erasable programmable read only memory.

EQC . Equipment check.

equipment check . An asynchronous indication of a malfunction.

Error log . A dataset or file in a product or system where error information is stored for later access.

ESD . Electrostatic discharge.

F

fault symptom code (FSC) . A hexadecimal code generated by the drive or the control unit microcode in response to a detected subsystem error.

FC . Feature code.

FCC . Federal communications commission.

FE . Field engineer, customer engineer, or service representative.

fiducial . A target used for teaching a physical location to a robot.

field replaceable unit (FRU) . An assembly that is replaced in its entirety when any one of its components fails.

file . A named set of records stored or processed as a unit. Also referred to as a dataset.

file protection . The processes and procedures established in an information system that are designed to inhibit unauthorized access to, contamination of, or deletion of a file.

file transfer protocol (FTP). In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

firmware. Proprietary code that is usually delivered as microcode 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.

FLASH EEPROM . An electrically erasable programmable read-only memory (EEPROM) that can be updated.

FMR . Field microcode replacement.

format . The arrangement or layout of data on a data medium.

formatter . Part of a magnetic tape subsystem that performs data conversion, speed matching, encoding, first level error recovery, and interfaces to one or more tape drives.

FP . File protect.

frayed . Damaged as if by an abrasive substance.

FRU . Field replaceable unit.

FSC . Fault symptom code.

FSI . Fault symptom index.

functional microcode . Microcode that is resident in the machine during normal customer operation.

G

g. Gram.

GB. gigabyte.

GBIC. Gigabit Interface Converter.

Gbi. gigabit

gigabit (Gbit). 1 000 000 000 bits.

gigabyte (GB). 1 000 000 000 bytes.

Gigabit Interface Converter (GBIC). Converts copper interface to optic interface.

gnd . Ground.

H

hertz (Hz) . Unit of frequency. One hertz equals one cycle per second.

hex . Hexadecimal.

High Voltage Differential (HVD). A logic signaling system that enables data communication between a supported host and the Tape Library. HVD signaling uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the signal is present in both a plus and minus state, and is thereby canceled. Synonymous with *differential*.

HVD. SCSI Bus High Voltage Differential

Hz . Hertz (cycles per second).

I

IBM Ultrium Tape Drive. Located within the Tape Library, a data-storage device that controls the movement of the magnetic tape in an IBM LTO Ultrium Tape Cartridge. The drive houses the mechanism (drive head) that reads and writes data to the tape. The drive is the first of four drives planned for the Ultrium format. Its native data capacity is 100 GB per cartridge; with 2:1 compression, its capacity is up to 200 GB.

ID . Identifier.

identifier (ID) . (1) In programming languages, a lexical unit that names a language object; for example, the names of variables, arrays, records, labels, or procedures. An identifier usually consists of a letter optionally followed by letters, digits, or other characters. (2) One or more characters used to identify or name

data element and possibly to indicate certain properties of that data element. (3) A sequence of bits or characters that identifies a program, device, or system to another program, device, or system.

IML . Initial microprogram load.

initial microprogram load (IML) . The action of loading a microprogram from an external storage to writable control storage.

initiator . The component that executes a command. The initiator can be the host system or the tape control unit.

INST . Installation.

interface . A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs.

interposer . The part used to convert a 68-pin connector to a 50-pin D-shell connector.

intervention required . Manual action is needed.

INTRO . Introduction.

I/O . Input/output.

IOP . Input/output processor.

IPL . Initial program load.

ITST . Idle-time self-test.

K

kilogram (kg). One thousand grams (approximately 2.2 pounds).

km . kilometer. 1000 Meters, Approximately 5/8 mile.

L

LAN . Local area network. A computer network within a limited area.

LCD. See *liquid crystal display*.

LED . Light-emitting diode.

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 Accelis format focuses on fast access; the Ultrium format

focuses on high capacity. The Ultrium format is the preferred format when capacity (rather than fast access) is the key storage consideration. An Ultrium cartridge has a compressed data capacity of up to 200 GB (2:1 compression) and a native data capacity of up to 100 GB. The Ultrium format is designed with a 4-generation road map that provides for up to 1.6 TB per cartridge (2:1 compression) in Generation 4, with compressed transfer rate of up to 320 MB per second.

liquid crystal display (LCD) . A low-power display technology used in computers and other I/O devices.

loadable . Having the ability to be loaded.

LTO cartridge memory (LTO-CM) . Within each LTO Ultrium data cartridge, an embedded electronics and interface module that can store and retrieve a cartridge's historical usage and other information.

LVD . SCSI Bus Low Voltage Differential

M

magnetic tape . A tape with a magnetical surface layer on which data can be stored by magnetic recording.

MAP . Maintenance analysis procedure.

mask . A pattern of characters that controls the retention or elimination of portions of another pattern of characters. To use a pattern of characters to control the retention or elimination of portions of another pattern of characters.

master file . A file used as an authority in a given job and that is relatively permanent, even though its contents may change. Synonymous with main file.

MB . Mega Byte (usually expressed as data rate in MB/s or MB/second).

media capacity . The amount of data that can be contained on a storage medium, expressed in bytes of data.

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.

mega . One million of.

meter . In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

micro . One millionth of.

microcode . (1) One or more micro instructions. (2) A code, representing the instructions of an instruction set,

implemented in a part of storage that is not program-addressable. (3) To design, write, and test one or more micro instructions. (4) See also *microprogram*.

microdiagnostic routine . A program that runs under the control of a supervisor, usually to identify field replaceable units.

microdiagnostic utility . A program that is run by the customer engineer to test the machine.

microinstruction . A basic or elementary machine instruction.

microprogram . A group of microinstructions that when executed performs a preplanned function.

The term microprogram represents a dynamic arrangement or selection of one or more groups of microinstructions for execution to perform a particular function. The term microcode represents microinstructions used in a product as an alternative to hard-wired circuitry to implement certain functions of a processor or other system component.

MIM . Media information message.

mm . Millimeter.

modifier . That which changes the meaning.

mount a device . To assign an I/O device with a request to the operator.

MP . Microprocessor.

ms . Millisecond.

MSG . Message.

multipath . Pertaining to using more than one path.

N

N/A . Not applicable.

node . In a network, a point at which one or more functional units connect channels or data circuits.

NVS . Nonvolatile storage. A storage device whose contents are not lost when power is cut off.

O

oersted . The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system. The oersted is the magnetic field strength in the interior of an elongated, uniformly wound solenoid that is excited with a linear current density in its winding of one abampere per 4π centimeters of axial length.

offline . Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with *online*.

online . Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with *offline*.

OPER . Operation.

ov . Over voltage.

overrun . Loss of data because a receiving device is unable to accept data at the rate it is transmitted.

overtightening . To tighten too much.

P

parameter . A variable that is given a constant value for a specified application and that may denote the application.

p bit . Parity bit.

PC . Parity check.

PCC . Power control compartment.

PDF . Portable Document Format.

PE . Parity error. Product engineer.

pick . Pertaining to the Tape Library, to remove, by means of a robotic device, a tape cartridge from a storage slot or drive.

picker . A robotic mechanism located inside the Tape Library that moves cartridges between the cartridge storage slots and the drive.

PM . Preventive maintenance.

POR . Power-on reset.

port . A physical connection for communication between the 3590 and the host processor. The 3590 has two SCSI ports.

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.

PROM . Programmable read only memory.

PS . Power supply.

PWR . Power.

R

rack . A unit that houses the components of a storage subsystem, such as the Tape Library.

rackmount kit . A packaged collection of articles used to install the rack mounted version of the Tape Library.

RAM . Random access memory.

Random access memory . A storage device into which data is entered and from which data is retrieved in a nonsequential manner.

RAS . Reliability, availability, and serviceability.

record . A collection of related data or words, treated as a unit.

recording density . The number of bits in a single linear track measured per unit of length of the recording medium.

recoverable error . An error condition that allows continued execution of a program.

ref . Reference.

reg . Register.

reinventor . To inventory again.

retension . The process or function of tightening the tape onto the cartridge, if it is sensed that the tape has a loose wrap on the cartridge.

RPQ . Request for price quotation.

R/W . Read/write.

S

s . Seconds of time.

SAC . Service Action Code. Code developed to indicate possible FRU or FRU's to replace to repair the hardware.

scratch cartridge . A data cartridge that contains no useful data, but can be written to with new data.

SCSI . Small computer system interface.

segment . A part.

sel . Select.

serialize . To change from parallel-by-byte to serial-by-bit.

serializer . A device that converts a space distribution of simultaneous states representing data into a corresponding time sequence of states.

servo, servos . An adjective for use in qualifying some part or aspect of a servomechanism.

servomechanism . A feedback control system in which at least one of the system signals represents mechanical motion.

Small Computer Systems Interface (SCSI) . A standard used by computer manufacturers for attaching peripheral devices (such as tape drives, hard disks, CD-ROM players, printers, and scanners) to computers (servers). Pronounced “scuzzy”. Variations of the SCSI interface provide for faster data transmission rates than standard serial and parallel ports (up to 160 megabytes per second). The variations include:

- Fast/Wide SCSI: Uses a 16-bit bus, and supports data rates of up to 20 MBps.
- SCSI-1: Uses an 8-bit bus, and supports data rates of 4 MBps.
- SCSI-2: Same as SCSI-1, but uses a 50-pin connector instead of a 25-pin connector, and supports multiple devices.
- Ultra SCSI: Uses an 8- or 16-bit bus, and supports data rates of 20 or 40 MBps.
- Ultra2 SCSI: Uses an 8- or 16-bit bus and supports data rates of 40 or 80 MBps.
- Ultra3 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.
- Ultra160 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.

SNS . Sense.

special feature . A feature that can be ordered to enhance the capability, storage capacity, or performance of a product, but is not essential for its basic work.

SR . Service representative, see also *CE*.

SRAM . Static random access memory.

SS . Status store.

ST . Store.

standard feature . The significant design elements of a product that are included as part of the fundamental product.

START . Start maintenance.

subsystem . A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system.

SUPP . Support.

sync . Synchronous, synchronize. Occurring with a regular or predictable time relationship.

T

tachometer, tach . A device that emits pulses that are used to measure/check speed or distance.

tape cartridge . A container holding magnetic tape that can be processed without separating it from the container.

tape void . An area in the tape in which no signal can be detected.

TCP/IP . Transmission Control Protocol/Internet Protocol.

TCU . Tape control unit.

TH . Thermal.

thread/load operation . A procedure that places tape along the tape path.

TM . Tapemark.

U

UART . Universal asynchronous receiver/transmitter.

unload . Prepare the tape cartridge for removal from the drive.

utilities . Utility programs.

utility programs . A computer program in general support of the processes of a computer; for instance, a diagnostic program.

uv . Under voltage.

V

VOLSER . Volume serial number.

volume . A certain portion of data, together with its data carrier, that can be handled conveniently as a unit.

VPD . Vital product data. The information contained within the tape drive that requires nonvolatile storage used by functional areas of the drive, and information required for manufacturing, RAS, and engineering.

W

word . A character string that is convenient for some purpose to consider as an entity.

Write . Write command.

WT . world trade.

X

XR . External register.

XRA . External register address register.

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